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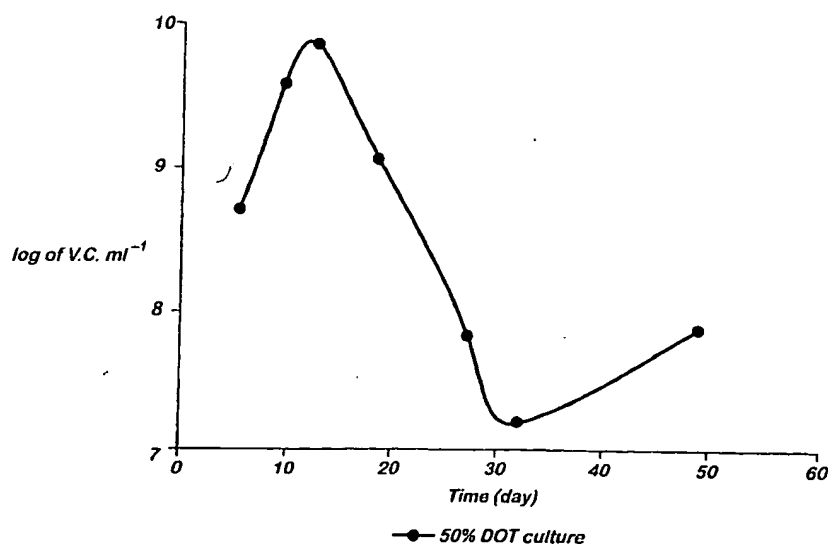
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(54) Title: MYCOBACTERIAL ANTIGENS EXPRESSED DURING LATENCY



(57) Abstract: A method is provided for identifying mycobacterial genes that are induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium. Said induced or up-regulated genes form the basis of nucleic acid vaccines, or provide targets to allow preparation of attenuated mycobacteria for vaccines against mycobacterial infections. Similarly, peptides encoded by said induced or up-regulated genes are employed in vaccines. In a further embodiment, the identified genes/peptides provide the means for identifying the presence of a mycobacterial infection in a clinical sample by nucleic acid probe or antibody detection.



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MYCOBACTERIAL ANTIGENS EXPRESSED DURING LATENCY

The present invention relates to a method of identifying a gene in mycobacteria the expression of which is induced or up-regulated during mycobacterial latency, to the isolated peptide products, variants, derivatives or fragments thereof, to antibodies that bind to said peptides, variants, derivatives or fragments, to DNA and RNA vectors that express said peptides, variants, derivatives or fragments, to attenuated mycobacteria in which the activity of at least one of said induced or up-regulated genes has been modified, to vaccines against mycobacterial infections, and to methods of detecting the presence of a mycobacterial infection.

Many microorganisms are capable of forming intracellular infections. These include: infections caused by species of *Salmonella*, *Yersinia*, *Shigella*, *Campylobacter*, *Chlamydia* and *Mycobacteria*. Some of these infections are exclusively intracellular, others contain both intracellular and extracellular components. However, it is the intracellular survival cycle of bacterial infection which is suspected as a main supportive factor for disease progression.

Generally, these microorganisms do not circulate freely in the body, for example, in the bloodstream, and are often not amenable to drug treatment regimes. Where drugs are available, this problem has been exacerbated by the development of multiple drug resistant microorganisms.

A number of factors have contributed to the problem of microbial resistance. One is the accumulation of mutations over time and the subsequent horizontal and vertical transfer of the mutated genes to other organisms. Thus, for a given pathogen, entire classes of antibiotics have been rendered inactive. A further factor has been the absence of a new class of antibiotics in recent years. The emergence of multiple drug-resistant pathogenic bacteria represents a serious threat to public health and new forms of therapy are urgently required.

For similar reasons, vaccine therapies have not proved effective against such intracellular microorganisms. Also, increased systemic concentration of antibiotics to improve bioavailability within cells may result in severe side effects.

Mycobacterium tuberculosis (TB) and closely related species make up a small group of mycobacteria known as the *Mycobacterium tuberculosis* complex

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(MTC). This group comprises four species *M. tuberculosis*, *M. microti*, *M. bovis* and *M. africanum* which are the causative agent in the majority of tuberculosis (TB) cases throughout the world.

5 *M. tuberculosis* is responsible for more than three million deaths a year world-wide. Other mycobacteria are also pathogenic in man and animals, for example *M. avium* subsp. *paratuberculosis* which causes Johne's disease in ruminants, *M. bovis* which causes tuberculosis in cattle, *M. avium* and *M. intracellulare* which cause tuberculosis in immunocompromised patients (eg. AIDS patients,
10 and bone marrow transplant patients) and *M. leprae* which causes leprosy in humans. Another important mycobacterial species is *M. vaccae*.

M. tuberculosis infects macrophage cells within the body. Soon after macrophage infection, most *M. tuberculosis* bacteria enter and replicate within
15 cellular phagosome vesicles, where the bacteria are sequestered from host defences and extracellular factors.

It is the intracellular survival and multiplication or replication of bacterial infection which is suspected as a main supportive factor for mycobacterial
20 disease progression.

A number of drug therapy regimens have been proposed for combatting *M. tuberculosis* infections, and currently combination therapy including the drug isoniazid has proved most effective. However, one problem with such treatment
25 regimes is that they are long-term, and failure to complete such treatment can promote the development of multiple drug resistant microorganisms.

A further problem is that of providing an adequate bioavailability of the drug within the cells to be treated. Whilst it is possible to increase the systemic
30 concentration of a drug (eg. by administering a higher dosage) this may result in severe side effects caused by the increased drug concentration.

The effectiveness of vaccine prevention against *M. tuberculosis* has varied widely. The current *M. tuberculosis* vaccine, BCG, is an attenuated strain of *M. bovis*. It is effective against severe complications of TB in children, but it varies
35 greatly in its effectiveness in adults particularly across ethnic groups. BCG vaccination has been used to prevent tuberculous meningitis and helps prevent

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the spread of *M. tuberculosis* to extra-pulmonary sites, but does not prevent infection.

5 The limited efficacy of BCG and the global prevalence of TB has led to an international effort to generate new, more effective vaccines. The current paradigm is that protection will be mediated by the stimulation of a Th1 immune response.

10 BCG vaccination in man was given orally when originally introduced, but that route was discontinued because of loss of viable BCG during gastric passage and of frequent cervical adenopathy. In experimental animal species, aerosol or intra-tracheal delivery of BCG has been achieved without adverse effects, but has varied in efficacy from superior protection than parenteral inoculation in primates, mice and guinea pigs to no apparent advantage over the
15 subcutaneous route in other studies.

There is therefore a need for an improved and/or alternative vaccine or therapeutic agent for combatting mycobacterial infections.

20 An additional major problem associated with the control of mycobacterial infections, especially *M. tuberculosis* infections, is the presence of a large reservoir of asymptomatic individuals infected with mycobacteria. Dormant mycobacteria are even more resistant to front-line drugs.

25 Infection with mycobacteria (eg. *M. tuberculosis*) rarely leads to active disease, and most individuals develop a latent infection which may persist for many years before reactivating to cause disease (Wayne, 1994). The current strategy for controlling such infection is early detection and treatment of patients with active disease. Whilst this is essential to avoid deaths and control transmission,
30 it has no effect on eliminating the existing reservoir of infection or on preventing new cases of disease through reactivation.

Conventional mycobacterial vaccines, including BCG, protect against disease and not against infection. Ideally a new mycobacterial vaccine will impart sterile
35 immunity, and a post-exposure vaccine capable of boosting the immune system to kill latent mycobacteria or prevent reactivation to active disease-causing microorganisms would also be valuable against latent infection.

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Conventional detection of latent mycobacterial infection by skin testing may be compromised. For example, current TB detection methods based on tuberculin skin testing are compromised by BCG vaccination and by exposure to environmental mycobacteria.

5

New strategies are therefore required for more effective diagnosis, treatment and prevention of mycobacterial latent infection.

10

To develop specific strategies for addressing latent mycobacterial infection it is necessary to elucidate the physiological, biochemical and molecular properties of these microorganisms.

15

At present, there is no suitable *in vivo* model for studying mycobacterial latent infection and such a model is unlikely to provide sufficient microbial material to enable detailed analysis of the physiological and molecular changes that occur.

20

Studies to date have used either static cultures which allow tubercle bacilli to generate oxygen-depletion gradients and enter a non-replicating persistent state in the sediment layer, or agitated sealed liquid cultures (Wayne and Lin, 1982; Cunningham and Spreadbury, 1998; Wayne and Hayes, 1996). Transition to a non-replicating persistent state in these models coincides with a shift-down to glyoxylate metabolism, resistance to isoniazid and rifampicin and susceptibility to the anaerobic bactericidal action of metronidazole (Wayne and Hayes, 1996).

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For example, a number of publications have described the analysis of mycobacterial gene and protein expression profiles following exposure of the mycobacteria to various environmental stimuli. These include Sherman, D.R. *et al* (2001) PNAS, vol. 98, no.13, pp.7534-7539; Hutter, B. (2000) FEMS Microbiol. Letts. 188, pp.141-146; Michele, T.M. *et al*. (1999) Antimicrobial Agents and Chemotherapy, vol. 43, no. 2, pp. 216-225; Yuan, Y. *et al*. (1998) PNAS, vol. 95, pp. 9578-9583; Boon, C. *et al* (2001) J. Bacteriol., vol. 183, no. 8, pp. 2672-2676; Cunningham, A.F. *et al* (1998) J. Bacteriol., vol. 180, no. 4, pp. 801-808; Murugasu-Oei, B. *et al* (1999) Mol. Gen. Genet., vol. 262, pp. 677-682; and a number of patent publications such as WO99/24067, WO99/04005, WO97/35611, and WO92/08484. The mycobacteria employed in these analyses have been grown in crude, batch systems, with the result that

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there is little or no control of the environmental stimuli to which the mycobacteria have been exposed. Accordingly, the bacteria experience a large number of complex, interactive environmental stimuli, some of which may have rapid and transient effects in terms of gene and protein expression.

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Such studies are poorly defined and controlled, and experiments relying on self-generated oxygen-depletion gradients have yielded inconsistent results. In addition, the described studies have been conducted over a relatively short duration in terms of post-inoculation growth, in many cases up to approximately 2 weeks post-inoculation, with the result that the cultured bacteria are exposed to environmental stimuli associated with the mid to late exponential phase, and/or the early stationary phase.

10

In view of the above, there is a need for a defined and controlled model for studying mycobacterial (eg. TB) persistence which simulates key features of the *in vivo* environment.

15

According to a first aspect of the present invention there is provided an isolated mycobacterial peptide, or a fragment or derivative or variant of said peptide, wherein the peptide is encoded by a mycobacterial gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

20

25

Latency is synonymous with persistence. These terms describe a reversible state of low metabolic activity in which mycobacterial cells can survive for extended periods without cell division.

30

In contrast to the various prior art analyses, the present invention is concerned with the induction or up-regulation of mycobacterial genes (and the corresponding gene products) during long term latency conditions rather than during the onset of latency (ie. late exponential phase, or early stationary phase).

35

The preferred culture method of the present invention is that of batch fermenter

culture. This method permits careful monitoring and control of growth culture parameters such as pH, temperature, available nutrients, and dissolved oxygen tension (DOT). In particular, temperature and DOT may be strictly controlled. In contrast, careful monitoring and control is not possible with convention,
5 crude batch culture systems, with the result that mycobacteria cultured by such systems are exposed to a multiplicity of complex, interactive environmental stimuli, some of which may have rapid and transient effects in terms of gene and protein expression. Thus, the batch fermenter system of the present invention allows relatively careful control of environmental stimuli so
10 that a mycobacterial response to a particular stimulus (eg. nutrient starvation) can be analysed in relative isolation from other environmental stimuli that may otherwise obscure or modify the particular mycobacterial response of interest.

In use of the present method it is possible to ensure that the principal latency
15 induction parameter employed is starvation of carbon, and preferably the starvation of carbon and energy. This means that the accidental induction or up-regulation of genes that are solely responsive to other environmental switches may be substantially prevented. Accordingly, false-positive identification of genes that are induced or up-regulated under conditions unrelated to carbon
20 starvation and/or energy limitation may be substantially avoided.

The term "nutrient-starving" in the context of the present invention means that the concentration of the primary carbon, and preferably the primary energy source, is insufficient to support growth of the mycobacteria. "Nutrient-
25 starving" is a term associated with an established mid to late stationary phase of a batch culture growth curve. Under such conditions the mycobacteria are metabolically stressed, rather than simply reduced in growth rate.

In more detail, exponential growth is that period of growth which is associated
30 with a logarithmic increase in mycobacterial cell mass (also known as the "log" phase) in which the bacteria are multiplying at a maximum specific growth rate for the prevailing culture conditions. During this period of growth the concentrations of essential nutrients diminish and those of end products increase. However, once the primary carbon and/or primary energy source falls
35 to below a critical level, it is no longer possible for all of the mycobacterial cells within the culture to obtain sufficient carbon and/or energy needed to support optimal cellular function and cell division. Once this occurs, exponential growth

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slows and the mycobacteria enter stationary phase. Thereafter, the mycobacteria become nutrient starved, and enter latency. It is this latent state in the growth phase, rather than the late exponential phase or early stationary phase, with which the present invention is concerned.

5

Carbon starvation refers to a growth state in which the concentration of exogenous carbon is insufficient to enable the bacteria to grow and or replicate. However, when in this state, there may be other energy sources (eg. endogenous reserves, secondary metabolites) that are available to maintain essential cellular functions and viability without supporting growth. Thus, carbon starvation is associated with a mid or late stationary phase condition in which the exogenous carbon source has become depleted and bacterial growth has substantially ceased. In terms of a batch fermenter culture of mycobacteria, this typically occurs at 20 days (or later) post inoculation.

15

The onset of stationary phase *vis-a-vis* the time of inoculation will depend on a number of factors such as the particular mycobacterial species/strain, the composition of the culture media (eg. the particular primary carbon and energy source), and the physical culture parameters employed.

20

However, as a guide, the end of exponential phase and the onset of stationary phase generally corresponds to that point in the growth phase associated with the maximum number of viable counts of mycobacteria.

25

In use of the present invention, the exponential phase mycobacterial cells are harvested from the culture vessel at a point in the growth phase before the maximum number of total viable counts has been achieved. This point in the growth phase may be mimicked under continuous culture conditions employing a steady state growth rate approximating μ_{\max} and providing a generation time of approximately 18-24 hours. In a preferred embodiment, the exponential phase mycobacterial cells are harvested when a value of between 2 and 0.5 (more preferably between 1 and 0.5) log units of viable counts per ml of culture medium less than the maximum number of viable counts per ml of culture medium has been achieved. Thus, the "exponential" phase cells are generally harvested during mid-log phase.

35

For example, if the maximum viable count value is 1×10^{10} per ml, then the

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"exponential" phase cells would be preferably harvested once a value of between 1×10^8 and $1 \times 10^{9.5}$ (more preferably between 1×10^9 and $1 \times 10^{9.5}$) viable counts per ml has been achieved. In the case of *M. tuberculosis*, this would be approximately 3-10, preferably 4-7 days post-inoculation.

5

In use of the present invention, the nutrient-starved, batch fermenter cultured mycobacterial cells are harvested from the culture vessel at a point in the growth phase after the maximum number of total viable counts has been achieved. This point in the growth phase may be mimicked under continuous
10 culture conditions supporting a generation time of at least 3 days. In a preferred embodiment, the stationary phase mycobacterial cells are harvested when the viable counts per ml of culture medium has fallen by at least 0.5, preferably at least 1, more preferably at least 2 log units less than the maximum number of viable counts per ml of culture medium. Thus, the nutrient-starved cells are
15 generally harvested during mid- to late-stationary phase.

For example, if the maximum viable count value is 1×10^{10} per ml, then the stationary phase cells would be preferably harvested once the viable count number had fallen to a value of at least $1 \times 10^{9.5}$, preferably at least 1×10^9 , more
20 preferably at least 1×10^8 viable counts per ml. In the case of *M. tuberculosis*, this would be approximately at least day 20, preferably at least day 30, typically day 40-50 post-inoculation. Longer post-inoculation harvesting times of at least 100 days, even at least 150 days may be employed. For mycobacteria generally, the mid to late stationary phase cells are preferably
25 harvested at least 20 days, preferably at least 30 days, more preferably at least 40 days post-inoculation.

Suitable media for culturing mycobacteria are described in Wayne, L.G. (1994) [*in* Tuberculosis: Pathogenesis, Protection, and Control published by the
30 American Society for Microbiology, pp. 73-83]. These include Middlebrook 7H9 Medium [see Barker, L.P., *et al.* (1998) *Molec. Microbiol.*, vol. 29(5), pp. 1167-1177], and WO00/52139 in the name of the present Applicant.

In use of the batch fermenter culture method, the starting concentration of the
35 primary carbon source (and preferably the primary energy source) is at least 0.5, preferably at least 1 g l^{-1} of culture medium. Such concentrations are considered to be not nutrient-starving. Conversely, "nutrient-starving"

conditions are associated with a primary carbon and energy source concentration of less than 0.5, preferably less than 0.2, and more preferably less than 0.1 gl^{-1} of culture medium. The preferred carbon and energy source is glycerol.

5

In a preferred embodiment, the starting concentration of glycerol is at least 1, preferably 1-3, more preferably approximately 2 gl^{-1} of culture medium. The onset of "nutrient-starving" conditions is associated with a concentration of less than 0.2, preferably less than 0.1 gl^{-1} of culture medium.

10

Other primary carbon and energy sources may be employed such as glucose, pyruvate, and fatty acids (eg. palmitate, and butyrate). These sources may be employed at substantially the same concentrations as for glycerol.

15

The pH of the culture medium is preferably maintained between pH 6 and 8, more preferably between pH 6.5 and 7.5, most preferably at about pH 6.9.

20

In one embodiment, the dissolved oxygen tension (DOT) is maintained throughout the culture process at at least 40 % air saturation, more preferably between 50 and 70 % air saturation, most preferably at 50% air saturation.

25

The dissolved oxygen tension parameter is calculated by means of an oxygen electrode and conventional laboratory techniques. Thus, 100 % air saturation corresponds to a solution that is saturated with air, whereas 0% corresponds to a solution that has been thoroughly purged with an inert gas such as nitrogen. Calibration is performed under standard atmospheric pressure conditions and measured at 37 °C, and with conventional air comprising approximately 21 % oxygen.

30

In another embodiment of the present invention, latency may be induced by a combination of carbon and/or energy source starvation, and a low DOT.

35

In a preferred embodiment, the DOT is maintained at at least 40 % air saturation, more preferably between 50 and 70 % air saturation, until the mycobacterial culture has entered early-mid log phase. The DOT may be then lowered so as to become limiting, for example in increments over a 5 or 6 day period, and the culture maintained at a DOT of 0-10, preferably at a DOT of

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approximately 5 % until the stationary phase cells are harvested.

5 The carbon and energy starvation, and optional low oxygen tension latency induction conditions of the present invention are culture conditions that are conducive for a mycobacterium to express at least one gene which would be normally expressed *in vivo* during latency of the mycobacterium's natural target environment which is believed to involve a low carbon and energy, and low oxygen environment.

10 The mycobacterium is selected from the species *M. phlei*, *M. smegmatis*, *M. africanum*, *M. caneti*, *M. fortuitum*, *M. marinum*, *M. ulcerans*, *M. tuberculosis*, *M. bovis*, *M. microti*, *M. avium*, *M. paratuberculosis*, *M. leprae*, *M. lepraemurium*, *M. intracellulare*, *M. scrofulaceum*, *M. xenopi*, *M. genavense*, *M. kansasii*, *M. simiae*, *M. szulgai*, *M. haemophilum*, *M. asiaticum*, *M. malmoense*,
15 *M. vaccae* and *M. shimoidei*. Of particular interest are members of the MTC, preferably *M. tuberculosis*.

In use, it is preferred that those genes (ie. as represented by cDNAs in the detection assay) which are up-regulated by at least 1.5-fold under stationary
20 phase conditions *vis-a-vis* exponential phase conditions are selected. In more preferred embodiments, the corresponding up-regulation selection criterium is at least 2-fold, more preferably 3-fold, most preferably 4-fold. In further embodiments up-regulation levels of at least 10-fold, preferably 50-fold may be employed.

25

The term peptide throughout this specification is synonymous with protein.

Use of mycobacterial peptide compositions, which peptides are associated with mycobacterial latency, provide excellent vaccine candidates for targeting latent
30 mycobacteria in asymptomatic patients infected with mycobacteria.

The terms "isolated," "substantially pure," and "substantially homogenous" are used interchangeably to describe a peptide which has been separated from components which naturally accompany it. A peptide is substantially pure when
35 at least about 60 to 75% of a sample exhibits a single peptide sequence. A substantially pure peptide will typically comprise about 60 to 90% w/w of a protein sample, more usually about 95%, and preferably will be over about

99% pure. Peptide purity or homogeneity may be indicated by, for example, polyacrylamide gel electrophoresis of a protein sample, followed by visualizing a single polypeptide band upon staining the gel. Alternatively, higher resolution may be provided by using, for example, HPLC.

5

A peptide is considered to be isolated when it is separated from the contaminants which accompany it in its natural state. Thus, a peptide which is chemically synthesized or synthesized in a cellular system different from the cell from which it naturally originates will be substantially free from its naturally associated components.

10

The present invention provides peptides which may be purified from mycobacteria as well as from other types of cells transformed with recombinant nucleic acids encoding these peptides.

15

If desirable, the amino acid sequence of the proteins of the present invention may be determined by protein sequencing methods.

20

The terms "peptide", "oligopeptide", "polypeptide", and "protein" are used interchangeably and do not refer to a specific length of the product. These terms embrace post-translational modifications such as glycosylation, acetylation, and phosphorylation.

25

The term "fragment" means a peptide having at least five, preferably at least ten, more preferably at least twenty, and most preferably at least thirty-five amino acid residues of the peptide which is the gene product of the induced or up-regulated gene in question. The fragment preferably includes an epitope of the gene product in question.

30

The term "variant" means a peptide or peptide "fragment" having at least seventy, preferably at least eighty, more preferably at least ninety percent amino acid sequence homology with the peptide that is the gene product of the induced or up-regulated gene in question. An example of a "variant" is a peptide or peptide fragment of an induced/up-regulated gene which contains one or more analogues of an amino acid (eg. an unnatural amino acid), or a substituted linkage. The terms "homology" and "identity" are considered synonymous in this specification. In a further embodiment, a "variant" may be

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a mimic of the peptide or peptide fragment, which mimic reproduces at least one epitope of the peptide or peptide fragment. The mimic may be, for example, a nucleic acid mimic, preferably a DNA mimic.

5 For sequence comparison, typically one sequence acts as a reference sequence, to which test sequences may be compared. When using a sequence comparison algorithm, test and reference sequences are input into a computer, subsequent coordinates are designated, if necessary, and sequence algorithm program parameters are designated. The sequence comparison algorithm then calculates
10 the percentage sequence identity for the test sequence(s) relative to the reference sequence, based on the designated program parameters.

Optimal alignment of sequences for comparison may be conducted, for example, by the local homology alignment algorithm of Smith and Waterman
15 [Adv. Appl. Math. 2: 484 (1981)], by the algorithm of Needleman & Wunsch [J. Mol. Biol. 48: 443 (1970)] by the search for similarity method of Pearson & Lipman [Proc. Nat'l. Acad. Sci. USA 85: 2444 (1988)], by computer implementations of these algorithms (GAP, BESTFIT, FASTA, and TFASTA - Sequence Analysis Software Package of the Genetics Computer Group,
20 University of Wisconsin Biotechnology Center, 1710 University Avenue, Madison, Wis. 53705), or by visual inspection [see Current Protocols in Molecular Biology, F.M. Ausbel et al, eds, Current Protocols, a joint venture between Greene Publishing Associates, Inc. and John Wiley & Sons, Inc. (1995 Supplement) Ausubel].

25 Examples of algorithms suitable for determining percent sequence similarity are the BLAST and BLAST 2.0 algorithms [see Altschul (1990) J. Mol. Biol. 215: pp. 403-410; and "<http://www.ncbi.nlm.nih.gov/>" of the National Center for Biotechnology Information].

30 In a preferred homology comparison, the identity exists over a region of the sequences that is at least 10 amino acid residues in length.

The term "derivative" means a peptide comprising the peptide (or fragment, or variant thereof) which is the gene product of the induced or up-regulated gene
35 in question. Thus, a derivative may include the peptide in question, and a further peptide sequence which may introduce one or more additional epitopes.

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The further peptide sequence should preferably not interfere with the basic folding and thus conformational structure of the peptide in question. Examples of a "derivative" are a fusion protein, a conjugate, and a graft. Thus, two or more peptides (or fragments, or variants) may be joined together to form a derivative. Alternatively, a peptide (or fragment, or variant) may be joined to an unrelated molecule (eg. a peptide). Derivatives may be chemically synthesized, but will be typically prepared by recombinant nucleic acid methods. Additional components such as lipid, and/or polysaccharide, and/or polyketide components may be included.

All of the molecules "fragment", "variant" and "derivative" have a common antigenic cross-reactivity and/or substantially the same *in vivo* biological activity as the gene product of the induced or up-regulated gene in question from which they are derived. For example, an antibody capable of binding to a fragment, variant or derivative would be also capable of binding to the gene product of the induced or up-regulated gene in question. It is a preferred feature that the fragment, variant and derivative each possess the active site of the peptide which is the induced or up-regulated peptide in question. Alternatively, all of the above embodiments of a peptide of the present invention share a common ability to induce a "recall response" of a T-lymphocyte which has been previously exposed to an antigenic component of a mycobacterial infection.

In a preferred embodiment, the peptide is selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279 and 281.

According to a second aspect of the invention there is provided a method of identifying a mycobacterial gene the expression of which is induced or up-regulated during mycobacterial latency, said method comprising:-

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culturing a first mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation;

5 culturing a second mycobacterium under culture conditions that are not nutrient-starving and which support exponential growth of the second mycobacterium;

10 obtaining first and second mRNA populations from said first and second mycobacteria respectively, wherein said first mRNA population is obtained from the first mycobacterium which has been cultured under nutrient-starving conditions obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation, and wherein said second mRNA is obtained from the second mycobacterium which has been cultured under conditions that are not nutrient-starving and which support exponential growth of said second
15 mycobacterium;

preparing first and second cDNA populations from said first and second mRNA populations respectively, during which cDNA preparation a detectable label is introduced into the cDNA molecules of the first and second cDNA populations;

20 isolating corresponding first and second cDNA molecules from the first and second cDNA populations, respectively;

comparing relative amounts of label or corresponding signal emitted from the label present in the isolated first and second cDNA molecules;

25 identifying a greater amount of label or signal provided by the isolated first cDNA molecule than that provided by the isolated second cDNA molecule; and

identifying the first cDNA and the corresponding mycobacterial gene which is induced or up-regulated during mycobacterial latency.

30 Reference to gene throughout this specification embraces open reading frames (ORFs).

The various embodiments described for the first aspect of the present invention apply equally to the second and subsequent aspects of the present invention.

35

The term "corresponding first and second cDNA molecules from the first and second cDNA populations" refers to cDNAs having substantially the same

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nucleotide sequence. Thus, by isolating the cDNA copies relating to a given gene under each culture condition (ie. exponential phase, and stationary phase), it is possible to quantify the relative copy number of cDNA for that gene for each culture condition. Since each cDNA copy has been produced from an mRNA molecule, the cDNA copy number reflects the corresponding mRNA copy number for each culture condition, and thus it is possible to identify induced or up-regulated genes.

In one embodiment, the first and second cDNA molecules are isolated from the corresponding first and second cDNA populations by hybridisation to an array containing immobilised DNA sequences that are representative of each known gene (or ORF) within a particular mycobacterial species genome. Thus, a first cDNA may be considered "corresponding" to a second cDNA if both cDNAs hybridise to the same immobilised DNA sequence.

In another embodiment, the first and second cDNAs are prepared by incorporation of a fluorescent label. The first and second cDNAs may incorporate labels which fluoresce at different wavelengths, thereby permitting dual fluorescence and simultaneous detection of two cDNA samples.

The type of label employed naturally determines how the output of the detection method is read. When using fluorescent labels, a confocal laser scanner is preferably employed.

According to one embodiment, fluorescently labelled cDNA sequences from stationary and exponential phase cultured systems were allowed to hybridise with a whole mycobacterial genome array. The first cDNA population was labelled with fluorescent label A, and the second cDNA population was labelled with fluorescent label B. The array was scanned at two different wavelengths corresponding to the excitable maxima of each dye and the intensity of the emitted light was recorded. Multiple arrays were preferably prepared for each cDNA and a mean intensity value was calculated across the two cDNA populations for each spot with each dye, against which relative induction or up-regulation was quantified.

In addition to the above mRNA isolation and cDNA preparation and labelling, genomic DNA may be isolated from the first and second mycobacteria. Thus,

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in a preferred embodiment, labelled DNA is also prepared from the isolated DNA. The labelled DNA may be then included on each array as a control.

5 According to a third aspect of the present invention, there is provided an inhibitor of a mycobacterial peptide, wherein the peptide is encoded by a gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-
10 starving and which support exponential growth of said mycobacterium, wherein the inhibitor is capable of preventing or inhibiting the mycobacterial peptide, from exerting its native biological effect.

Such inhibitors may be employed to prevent the onset of, or to cause a break
15 in the period of mycobacterial latency (ie. induce re-activation). In this respect, mycobacteria are more susceptible to treatment regimens when in a non-latent state, and the combined use of drugs to kill latent mycobacteria (eg. TB) would significantly reduce the incidence of mycobacteria by targeting the reservoir for new disease and would thereby help reduce the problem of emerging
20 drug-resistant strains.

The inhibitor may be a peptide, carbohydrate, synthetic molecule, or an analogue thereof. Inhibition of the mycobacterial peptide may be effected at the nucleic acid level (ie. DNA, or RNA), or at the peptide level. Thus, the inhibitor
25 may act directly on the peptide. Alternatively, the inhibitor may act indirectly on the peptide by, for example, causing inactivation of the induced or up-regulated mycobacterial gene.

In preferred embodiments, the inhibitor is capable of inhibiting one or more of
30 the following:- 2-nitropropane dioxygenase, acetyltransferase, oxidoreductase, transcriptional regulator, acyl transferase, UDP-glucose dehydrogenase, phosphoribosylglycinamide formyltransferase, 1,4-dihydroxy-2-naphthoate octaprenyl, gmc-type oxidoreductase, 3-hydroxyisobutyrate dehydrogenase, methylmalonate semialdehyde dehydrogenase, dehydrogenase, mercuric
35 reductase, glutathione reductase, dihydrolipoamide, transposase, proline iminopeptidase, prolyl aminopeptidase, quinolone efflux pump, glycine betaine transporter, phosphatidylethanolamine N-methyltransferase, chalcone synthase

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2, sulfotransferase, glycosyl transferase, fumarate reductase flavoprotein, 8-amino-7-oxononanoate synthase, aminotransferase class-II pyridoxal-phosphate, bacteriophage HK97 prohead protease, penicillin-binding protein, fatty acyl-CoA racemase, nitrilotriacetate monooxygenase, histidine kinase response regulator, 5 peptidase, LysR transcription regulator, excisionase, ornithine aminotransferase, malate oxidoreductase, thiosulphate binding protein, enoyl-CoA hydratase, acyl-CoA synthetase, methyltransferase, siroheme synthase, permease, glutaryl 7-aca acylase, sn-glycerol-3-phosphate transport system permease, enoyl-CoA hydratase/isomerase, acyl-CoA dehydrogenase, esterase, lipase, cytidine 10 deaminase, crotonase, lipid-transfer protein, acetyl-CoA C-acetyltransferase, aminotransferase, hydrolase, and 2-amino-4-hydroxy-6-hydroxymethyldihydropterine pyrophosphokinase.

15 In a further embodiment, the inhibitor may be an antibiotic capable of targeting the induced or up-regulated mycobacterial gene identifiable by the present invention, or the gene product thereof. The antibiotic is preferably specific for the gene and/or gene product.

20 In a further embodiment, the inhibitor may act on a gene or gene product the latter of which interacts with the induced or up-regulated gene. Alternatively, the inhibitor may act on a gene or gene product thereof upon which the gene product of the induced or up-regulated gene acts.

25 Inhibitors of the present invention may be prepared utilizing the sequence information of provided herein. For example, this may be performed by overexpressing the peptide, purifying the peptide, and then performing X-ray crystallography on the purified peptide to obtain its molecular structure. Next, compounds are created which have similar molecular structures to all or portions of the polypeptide or its substrate. The compounds may be then 30 combined with the peptide and attached thereto so as to block one or more of its biological activities.

Also included within the invention are isolated or recombinant polynucleotides that bind to the regions of the mycobacterial chromosome containing 35 sequences that are associated with induction/up-regulation under low oxygen tension (ie. virulence), including antisense and triplex-forming polynucleotides. As used herein, the term "binding" refers to an interaction or complexation

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between an oligonucleotide and a target nucleotide sequence, mediated through hydrogen bonding or other molecular forces. The term "binding" more specifically refers to two types of internucleotide binding mediated through base-base hydrogen bonding. The first type of binding is "Watson-Crick-type" binding interactions in which adenine-thymine (or adenine-uracil) and guanine-cytosine base-pairs are formed through hydrogen bonding between the bases. An example of this type of binding is the binding traditionally associated with the DNA double helix and in RNA-DNA hybrids; this type of binding is normally detected by hybridization procedures.

The second type of binding is "triplex binding". In general, triplex binding refers to any type of base-base hydrogen bonding of a third polynucleotide strand with a duplex DNA (or DNA-RNA hybrid) that is already paired in a Watson-Crick manner.

In a preferred embodiment, the inhibitor may be an antisense nucleic acid sequence which is complementary to at least part of the inducible or up-regulatable gene.

The inhibitor, when in the form of a nucleic acid sequence, in use, comprises at least 15 nucleotides, preferably at least 20 nucleotides, more preferably at least 30 nucleotides, and most preferably at least 50 nucleotides.

According to a fourth aspect of the invention, there is provided an antibody that binds to a peptide encoded by a gene, or to a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated during culture of a mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

The antibody preferably has specificity for the peptide in question, and following binding thereto may initiate coating of the mycobacterium. Coating of the bacterium preferably leads to opsonization thereof. This, in turn, leads to the bacterium being destroyed. It is preferred that the antibody is specific for the mycobacterium (eg. species and/or strain) which is to be targeted.

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In use, the antibody is preferably embodied in an isolated form.

Opsonization by antibodies may influence cellular entry and spread of mycobacteria in phagocytic and non-phagocytic cells by preventing or
5 modulating receptor-mediated entry and replication in macrophages.

The peptides, fragments, variants or derivatives of the present invention may be used to produce antibodies, including polyclonal and monoclonal antibodies. If polyclonal antibodies are desired, a selected mammal (eg. mouse, rabbit,
10 goat, horse, etc.) is immunized with an immunogenic polypeptide. Serum from the immunized animal is collected and treated according to known procedures. If serum containing polyclonal antibodies to a desired mycobacterial epitope contains antibodies to other antigens, the polyclonal antibodies may be purified by immunoaffinity chromatography.

15 Alternatively, general methodology for making monoclonal antibodies by hybridomas involving, for example, preparation of immortal antibody-producing cell lines by cell fusion, or other techniques such as direct transformation of B lymphocytes with oncogenic DNA, or transfection with Epstein-Barr virus may
20 be employed.

The antibody employed in this aspect of the invention may belong to any antibody isotype family, or may be a derivative or mimic thereof. Reference to antibody throughout this specification embraces recombinantly produced
25 antibody, and any part of an antibody which is capable of binding to a mycobacterial antigen.

In one embodiment the antibody belongs to the IgG, IgM or IgA isotype families.

30 In a preferred embodiment, the antibody belongs to the IgA isotype family. Reference to the IgA isotype throughout this specification includes the secretory form of this antibody (ie. sIgA). The secretory component (SC) of sIgA may be added *in vitro* or *in vivo*. In the latter case, the use of a patient's
35 natural SC labelling machinery may be employed.

In one embodiment, the antibody may be raised against a peptide from a

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member of the MTC, preferably against *M. tuberculosis*.

In a preferred embodiment, the antibody is capable of binding to a peptide selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281 and a fragment, variant, and derivative of said SEQ IDs.

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In a further embodiment, the antigen is an exposed component of a mycobacterial bacillus. In another embodiment, the antigen is a cell surface component of a mycobacterial bacillus.

20 The antibody of the present invention may be polyclonal, but is preferably monoclonal.

Without being bound by any theory, it is possible that following mycobacterial infection of a macrophage, the macrophage is killed and the bacilli are released.

25 It is at this stage that the mycobacteria are considered to be most vulnerable to antibody attack. Thus, it is possible that the antibodies of the present invention act on released bacilli following macrophage death, and thereby exert a post-infection effect.

30 It is possible that the passive protection aspect (ie. delivery of antibodies) of the present invention is facilitated by enhanced accessibility of the antibodies of the present invention to antigens on mycobacterial bacilli harboured by the infected macrophages. Indeed, *acr* expression is low during logarithmic growth, but increases at the stationary or oxygen limiting stage, and particularly in
35 organisms which replicate within macrophages. As *acr* expression appears to be necessary for mycobacterial infectivity, it is possible that antibody binding may block macrophage infection by steric hindrance or disruption of its

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oligomeric structure. Thus, antibodies acting on mycobacterial bacilli released from killed, infected macrophages may interfere with the spread of re-infection to fresh macrophages. This hypothesis involves a synergistic action between antibodies and cytotoxic T cells, acting early after infection, eg. $\gamma\delta$ and NK T cells, but could later involve also CD8 and CD4 cytotoxic T cells.

According to a fifth aspect of the invention, there is provided an attenuated mycobacterium in which a gene has been modified thereby rendering the mycobacterium substantially non-pathogenic, wherein said gene is a gene the expression of which is induced or up-regulated during culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

The modification preferably inactivates the gene in question, and preferably renders the mycobacterium substantially non-pathogenic.

The term "modified" refers to any genetic manipulation such as a nucleic acid or nucleic acid sequence replacement, a deletion, or an insertion which renders the mycobacterium substantially reduced in ability to persist in a latent state. In one embodiment the entire inducible or up-regulatable gene may be deleted.

In a preferred embodiment, gene to be modified has a wild-type coding sequence selected from the group consisting of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280 and 282.

It will be appreciated that the above wild-type sequences may include minor variations depending on the Database employed. The term "wild-type" indicates

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that the sequence in question exists as a coding sequence in nature.

According to a sixth aspect of the invention, there is provided an attenuated microbial carrier, comprising a peptide encoded by a gene, or a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

In use, the peptide (or fragment, variant or derivative) is either at least partially exposed at the surface of the carrier, or the carrier becomes degraded *in vivo* so that at least part of the peptide (or fragment, variant or derivative) is otherwise exposed to a host's immune system.

In a preferred embodiment, the attenuated microbial carrier is attenuated salmonella, attenuated vaccinia virus, attenuated fowlpox virus, or attenuated *M. bovis* (eg. BCG strain).

In a preferred embodiment, the peptide is selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279 and 281.

According to a seventh aspect of the invention, there is provided a DNA plasmid comprising a promoter, a polyadenylation signal, and a DNA sequence that is the coding sequence of a mycobacterial gene or a fragment or variant or derivative of said coding sequence, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which

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maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium, wherein the promoter and polyadenylation signal are operably linked to the DNA sequence.

The term DNA "fragment" used in this invention will usually comprise at least about 5 codons (15 nucleotides), more usually at least about 7 to 15 codons, and most preferably at least about 35 codons. This number of nucleotides is usually about the minimal length required for a successful probe that would hybridize specifically with such a sequence.

In preferred embodiments, the DNA "fragment" has a nucleotide length which is at least 50%, preferably at least 70%, and more preferably at least 80% that of the coding sequence of the corresponding induced/up-regulated gene.

The term DNA "variant" means a DNA sequence that has substantial homology or substantial similarity to the coding sequence (or a fragment thereof) of an induced/up-regulated gene. A nucleic acid or fragment thereof is "substantially homologous" (or "substantially similar") to another if, when optimally aligned (with appropriate nucleotide insertions or deletions) with the other nucleic acid (or its complementary strand), there is nucleotide sequence identity in at least about 60% of the nucleotide bases, usually at least about 70%, more usually at least about 80%, preferably at least about 90%, and more preferably at least about 95 to 98% of the nucleotide bases. Homology determination is performed as described *supra* for peptides.

Alternatively, a DNA "variant" is substantially homologous (or substantially similar) with the coding sequence (or a fragment thereof) of an induced/up-regulated gene when they are capable of hybridizing under selective hybridization conditions. Selectivity of hybridization exists when hybridization occurs which is substantially more selective than total lack of specificity. Typically, selective hybridization will occur when there is at least about 65% homology over a stretch of at least about 14 nucleotides, preferably at least about 70%, more preferably at least about 75%, and most preferably at least about 90%. See, Kanehisa (1984) Nuc. Acids Res. 12:203-213. The length of homology comparison, as described, may be over longer stretches, and in

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certain embodiments will often be over a stretch of at least about 17 nucleotides, usually at least about 20 nucleotides, more usually at least about 24 nucleotides, typically at least about 28 nucleotides, more typically at least about 32 nucleotides, and preferably at least about 36 or more nucleotides.

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Nucleic acid hybridization will be affected by such conditions as salt concentration (eg. NaCl), temperature, or organic solvents, in addition to the base composition, length of the complementary strands, and the number of nucleotide base mismatches between the hybridizing nucleic acids, as will be readily appreciated by those skilled in the art. Stringent temperature conditions are preferably employed, and generally include temperatures in excess of 30°C, typically in excess of 37°C and preferably in excess of 45°C. Stringent salt conditions will ordinarily be less than 1000 mM, typically less than 500 mM, and preferably less than 200 mM. The pH is typically between 7.0 and 8.3. However, the combination of parameters is much more important than the measure of any single parameter. See, eg., Wetmur and Davidson (1968) J. Mol. Biol. 31:349-370.

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The term DNA "derivative" means a DNA polynucleotide which comprises a DNA sequence (or a fragment, or variant thereof) corresponding to the coding sequence of the induced/up-regulated gene and an additional DNA sequence which is not naturally associated with the DNA sequence corresponding to the coding sequence. The comments on peptide derivative *supra* also apply to DNA "derivative". A "derivative" may, for example, include two or more coding sequences of a mycobacterial operon that is induced during nutrient-starvation. Thus, depending on the presence or absence of a non-coding region between the coding sequences, the expression product/s of such a "derivative" may be a fusion protein, or separate peptide products encoded by the individual coding regions.

The above terms DNA "fragment", "variant", and "derivative" have in common with each other that the resulting peptide products have cross-reactive antigenic properties which are substantially the same as those of the corresponding wild-type peptide. Preferably all of the peptide products of the above DNA molecule embodiments of the present invention bind to an antibody which also binds to the wild-type peptide. Alternatively, all of the above peptide products are capable of inducing a "recall response" of a T lymphocyte which

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has been previously exposed to an antigenic component of a mycobacterial infection.

5 The promoter and polyadenylation signal are preferably selected so as to ensure that the gene is expressed in a eukaryotic cell. Strong promoters and polyadenylation signals are preferred.

10 In a related aspect, the present invention provides an isolated RNA molecule which is encoded by a DNA sequence of the present invention, or a fragment or variant or derivative of said DNA sequence.

15 An "isolated" RNA is an RNA which is substantially separated from other mycobacterial components that naturally accompany the sequences of interest, eg., ribosomes, polymerases, and other mycobacterial polynucleotides such as DNA and other chromosomal sequences.

The above RNA molecule may be introduced directly into a host cell as, for example, a component of a vaccine.

20 Alternatively the RNA molecule may be incorporated into an RNA vector prior to administration.

25 The polynucleotide sequences (DNA and RNA) of the present invention include a nucleic acid sequence which has been removed from its naturally occurring environment, and recombinant or cloned DNA isolates and chemically synthesized analogues or analogues biologically synthesized by heterologous systems.

30 The term "recombinant" as used herein intends a polynucleotide of genomic, cDNA, semisynthetic, or synthetic origin which, by virtue of its origin or manipulation: (1) is not associated with all or a portion of a polynucleotide with which it is associated in nature; or (2) is linked to a polynucleotide other than that to which it is linked in nature; and (3) does not occur in nature. This artificial combination is often accomplished by either chemical synthesis means, 35 or by the artificial manipulation of isolated segments of nucleic acids, eg., by genetic engineering techniques. Such is usually done to replace a codon with a redundant codon encoding the same or a conservative amino acid, while

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typically introducing or removing a sequence recognition site. Alternatively, it is performed to join together nucleic acid segments of desired functions to generate a desired combination of functions.

5 In embodiments of the invention the polynucleotides may encode a peptide (or fragment, variant, or derivative) which is induced or up-regulated under nutrient-starving conditions. A nucleic acid is said to "encode" a peptide if, in its native state or when manipulated, it can be transcribed and/or translated to produce the peptide (or fragment, variant or derivative thereof). The anti-sense
10 strand of such a nucleic acid is also said to encode the peptide (or fragment, variant, or derivative).

Also contemplated within the invention are expression vectors comprising the polynucleotide of interest. Expression vectors generally are replicable
15 polynucleotide constructs that encode a peptide operably linked to suitable transcriptional and translational regulatory elements. Examples of regulatory elements usually included in expression vectors are promoters, enhancers, ribosomal binding sites, and transcription and translation initiation and termination sequences. These regulatory elements are operably linked to the
20 sequence to be translated. A nucleic acid sequence is operably linked when it is placed into a functional relationship with another nucleic acid sequence. For instance, a promoter is operably linked to a coding sequence if the promoter affects its transcription or expression. Generally, operably linked means that the DNA sequences being linked are contiguous and, where necessary to join two
25 protein coding regions, contiguous and in reading frame. The regulatory elements employed in the expression vectors containing a polynucleotide encoding a virulence factor are functional in the host cell used for expression.

The polynucleotides of the present invention may be prepared by any means
30 known in the art. For example, large amounts of the polynucleotides may be produced by replication in a suitable host cell. The natural or synthetic DNA fragments coding for a desired fragment will be incorporated into recombinant nucleic acid constructs, typically DNA constructs, capable of introduction into and replication in a prokaryotic or eukaryotic cell. Usually the DNA constructs
35 will be suitable for autonomous replication in a unicellular host, such as yeast or bacteria, but may also be intended for introduction to and integration within the genome of a cultured insect, mammalian, plant or other eukaryotic cell lines.

The polynucleotides of the present invention may also be produced by chemical synthesis, e.g., by the phosphoramidite method or the triester method, and may be performed on commercial automated oligonucleotide synthesizers. A double-stranded fragment may be obtained from the single stranded product of chemical synthesis either by synthesizing the complementary strand and annealing the strand together under appropriate conditions or by adding the complementary strand using DNA polymerase with an appropriate primer sequence.

10

DNA constructs prepared for introduction into a prokaryotic or eukaryotic host will typically comprise a replication system recognized by the host, including the intended DNA fragment encoding the desired peptide, and will preferably also include transcription and translational initiation regulatory sequences operably linked to the polypeptide encoding segment. Expression vectors may include, for example, an origin of replication or autonomously replicating sequence (ARS) and expression control sequences, a promoter, an enhancer and necessary processing information sites, such as ribosome-binding sites, RNA splice sites, polyadenylation sites, transcriptional terminator sequences, and mRNA stabilizing sequences. Secretion signals from polypeptides secreted from the host cell of choice may also be included where appropriate, thus allowing the protein to cross and/or lodge in cell membranes, and thus attain its functional topology or be secreted from the cell.

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Appropriate promoter and other necessary vector sequences will be selected so as to be functional in the host, and may, when appropriate, include those naturally associated with mycobacterial genes. Promoters such as the trp, lac and phage promoters, tRNA promoters and glycolytic enzyme promoters may be used in prokaryotic hosts. Useful yeast promoters include the promoter regions for metallothionein, 3-phosphoglycerate kinase or other glycolytic enzymes such as enolase or glyceraldehyde-3-phosphate dehydrogenase, enzymes responsible for maltose and galactose utilization, and others.

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Appropriate non-native mammalian promoters may include the early and late promoters from SV40 or promoters derived from murine moloney leukemia virus, mouse mammary tumour virus, avian sarcoma viruses, adenovirus II, bovine papilloma virus or polyoma. In addition, the construct may be joined to

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an amplifiable gene (e.g., DHFR) so that multiple copies of the gene may be made.

While such expression vectors may replicate autonomously, they may less preferably replicate by being inserted into the genome of the host cell.

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Expression and cloning vectors will likely contain a selectable marker, a gene encoding a protein necessary for the survival or growth of a host cell transformed with the vector. The presence of this gene ensures the growth of only those host cells which express the inserts. Typical selection genes encode proteins that (a) confer resistance to antibiotics or other toxic substances, e.g. ampicillin, neomycin, methotrexate, etc.; (b) complement auxotrophic deficiencies; or (c) supply critical nutrients not available from complex media, e.g. the gene encoding D-alanine racemase for *Bacilli*. The choice of appropriate selectable marker will depend on the host cell.

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The vectors containing the nucleic acids of interest can be transcribed *in vitro* and the resulting RNA introduced into the host cell (e.g., by injection), or the vectors can be introduced directly into host cells by methods which vary depending on the type of cellular host, including electroporation; transfection employing calcium chloride, rubidium chloride, calcium phosphate, DEAE-dextran, or other substances; microprojectile bombardment; lipofection; infection (where the vector is an infectious agent, such as a retroviral genome). The cells into which have been introduced nucleic acids described above are meant to also include the progeny of such cells.

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Large quantities of the nucleic acids and peptides of the present invention may be prepared by expressing the nucleic acids or portions thereof in vectors or other expression vehicles in compatible prokaryotic or eukaryotic host cells. The most commonly used prokaryotic hosts are strains of *Escherichia coli*, although other prokaryotes, such as *Bacillus subtilis* or *Pseudomonas* may also be used.

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Mammalian or other eukaryotic host cells, such as those of yeast, filamentous fungi, plant, insect, amphibian or avian species, may also be useful for production of the proteins of the present invention. Propagation of mammalian cells in culture is *per se* well known. Examples of commonly used mammalian host cell lines are VERO and HeLa cells, Chinese hamster ovary (CHO) cells, and WI38, BHK, and COS cell lines, although other cell lines may be

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appropriate, e.g., to provide higher expression, desirable glycosylation patterns.

Clones are selected by using markers depending on the mode of the vector construction. The marker may be on the same or a different DNA molecule, preferably the same DNA molecule. The transformant may be screened or, preferably, selected by any of the means well known in the art, e.g., by resistance to such antibiotics as ampicillin, tetracycline.

The polynucleotides of the invention may be inserted into the host cell by any means known in the art, including for example, transformation, transduction, and electroporation. As used herein, "recombinant host cells", "host cells", "cells", "cell lines", "cell cultures", and other such terms denoting microorganisms or higher eukaryotic cell lines cultured as unicellular entities refer to cells which can be, or have been, used as recipients for recombinant vector or other transfer DNA, and include the progeny of the original cell which has been transformed. It is understood that the progeny of a single parental cell may not necessarily be completely identical in morphology or in genomic or total DNA complement as the original parent, due to natural, accidental, or deliberate mutation. "Transformation", as used herein, refers to the insertion of an exogenous polynucleotide into a host cell, irrespective of the method used for the insertion, for example, direct uptake, transduction, f-mating or electroporation. The exogenous polynucleotide may be maintained as a non-integrated vector, for example, a plasmid, or alternatively, may be integrated into the host cell genome.

In one embodiment, a DNA plasmid or RNA vector may encode a component of the immune system which is specific to an immune response following challenge with a peptide, wherein said peptide is encoded by a mycobacterial gene that is induced or up-regulated during nutrient-starvation, and optionally oxygen starvation.

An example of such a component is an antibody to the peptide product of the induced or up-regulated gene. Thus, in one embodiment, the nucleic acid sequence (eg. DNA plasmid, or RNA vector) encodes the antibody in question.

An eighth aspect provides use of the aforementioned aspects of the present invention, namely a peptide or fragment or variant or derivative thereof, an

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inhibitor, an antibody, an attenuated mycobacterium, an attenuated microbial carrier, a DNA sequence that is the coding sequence of an induced or up-regulated mycobacterial gene or a fragment or variant or derivative of said coding sequence, a DNA plasmid comprising said DNA sequence, an RNA sequence encoded by said DNA sequence (including DNA fragment, variant, derivative), and/or an RNA vector comprising said RNA sequence, in the manufacture of a medicament for treating or preventing a mycobacterial infection.

The term "preventing" includes reducing the severity/intensity of, or initiation of, a mycobacterial infection.

The term "treating" includes post-infection therapy and amelioration of a mycobacterial infection.

In a related aspect, there is provided a method of treating or preventing a mycobacterial infection, comprising administration of a medicament (namely the aforementioned aspects of the present invention) selected from the group consisting of a peptide or fragment or variant or derivative thereof, an inhibitor, an antibody, an attenuated mycobacterium, an attenuated microbial carrier, a DNA sequence that is the coding sequence of an induced or up-regulated mycobacterial gene or a fragment or variant or derivative of said coding sequence, a DNA plasmid comprising said DNA sequence, an RNA sequence encoded by said DNA sequence, and/or an RNA vector comprising said RNA sequence, to a patient.

The immunogenicity of the epitopes of the peptides of the invention may be enhanced by preparing them in mammalian or yeast systems fused with or assembled with particle-forming proteins such as, for example, that associated with hepatitis B surface antigen. Vaccines may be prepared from one or more immunogenic peptides of the present invention.

Typically, such vaccines are prepared as injectables, either as liquid solutions or suspensions; solid forms suitable for solution in, or suspension in, liquid prior to injection may also be prepared. The preparation may also be emulsified, or the peptide encapsulated in liposomes. The active immunogenic ingredients are often mixed with excipients which are pharmaceutically acceptable and

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compatible with the active ingredient. Suitable excipients are, for example, water, saline, dextrose, glycerol, ethanol, or the like and combinations thereof. In addition, if desired, the vaccine may contain minor amounts of auxiliary substances such as wetting or emulsifying agents, pH buffering agents, and/or
5 adjuvants which enhance the effectiveness of the vaccine. Examples of adjuvants which may be effective include but are not limited to: aluminum hydroxide, N-acetyl-muramyl-L-threonyl-D-isoglutamine (thr-MDP), N-acetyl-nor-muramyl-L-alanyl-D-isoglutamine (CGP 11637, referred to as nor-MDP), N-acetylmuramyl-L-alanyl-D-isoglutaminyl-L-alanine-2-(1'-2'-dipalm
10 itoyl-sn-glycero-3-hydroxyphosphoryloxy)-ethylamine (CGP 19835A, referred to as MTP-PE), and RIBI, which contains three components extracted from bacteria, monophosphoryl lipid A, trehalose dimycolate and cell wall skeleton (MPL + TDM + CWS) in a 2% squalene/Tween 80 emulsion.

15 The vaccines are conventionally administered parenterally, by injection, for example, either subcutaneously or intramuscularly. Additional formulations which are suitable for other modes of administration include suppositories and, in some cases, oral formulations or formulations suitable for distribution as aerosols. For suppositories, traditional binders and carriers may include, for
20 example, polyalkylene glycols or triglycerides; such suppositories may be formed from mixtures containing the active ingredient in the range of 0.5% to 10%, preferably 1%-2%. Oral formulations include such normally employed excipients as, for example, pharmaceutical grades of mannitol, lactose, starch, magnesium stearate, sodium saccharine, cellulose, magnesium carbonate, and
25 the like. These compositions take the form of solutions, suspensions, tablets, pills, capsules, sustained release formulations or powders and contain 10%-95% of active ingredient, preferably 25%-70%.

The peptides may be formulated into the vaccine as neutral or salt forms.
30 Pharmaceutically acceptable salts include the acid addition salts (formed with free amino groups of the peptide) and which are formed with inorganic acids such as, for example, hydrochloric or phosphoric acids, or with organic acids such as acetic, oxalic, tartaric, maleic, and the like. Salts formed with the free carboxyl groups may also be derived from inorganic bases such as, for example,
35 sodium, potassium, ammonium, calcium, or ferric hydroxides, and such organic bases as isopropylamine, trimethylamine, 2-ethylamino ethanol, histidine, procaine, and the like.

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5 The vaccines are administered in a manner compatible with the dosage formulation, and in such amount as will be prophylactically and/or therapeutically effective. The quantity to be administered, which is generally in the range of 5 micrograms to 250 micrograms of antigen per dose, depends on the subject to be treated, capacity of the subject's immune system to synthesize antibodies, and the degree of protection desired. Precise amounts of active ingredient required to be administered may depend on the judgment of the practitioner and may be peculiar to each subject.

10

The vaccine may be given in a single dose schedule, or preferably in a multiple dose schedule. A multiple dose schedule is one in which a primary course of vaccination may be with 1-10 separate doses, followed by other doses given at subsequent time intervals required to maintain and or re-enforce the immune response, for example, at 1-4 months for a second dose, and if needed, a subsequent dose(s) after several months. The dosage regimen will also, at least in part, be determined by the need of the individual and be dependent upon the judgment of the practitioner.

15

20 In addition, the vaccine containing the immunogenic mycobacterial antigen(s) may be administered in conjunction with other immunoregulatory agents, for example, immunoglobulins, as well as antibiotics.

25 The medicament may be administered by conventional routes, eg. intravenous, intraperitoneal, intranasal routes.

30 The outcome of administering antibody-containing compositions may depend on the efficiency of transmission of antibodies to the site of infection. In the case of a mycobacterial respiratory infection (eg. a *M. tuberculosis* infection), this may be facilitated by efficient transmission of antibodies to the lungs.

35 In one embodiment the medicament may be administered intranasally (i.n.). This mode of delivery corresponds to the route of delivery of a *M. tuberculosis* infection and, in the case of antibody delivery, ensures that antibodies are present at the site of infection to combat the bacterium before it becomes intracellular and also during the period when it spreads between cells.

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An intranasal composition may be administered in droplet form having approximate diameters in the range of 100-5000 μm , preferably 500-4000 μm , more preferably 1000-3000 μm . Alternatively, in terms of volume, the droplets would be in the approximate range of 0.001-100 μl , preferably 0.1-50 μl , more preferably 1.0-25 μl .

Intranasal administration may be achieved by way of applying nasal droplets or via a nasal spray.

In the case of nasal droplets, the droplets may typically have a diameter of approximately 1000-3000 μm and/or a volume of 1-25 μl .

In the case of a nasal spray, the droplets may typically have a diameter of approximately 100-1000 μm and/or a volume of 0.001-1 μl .

It is possible that, following i.n. delivery of antibodies, their passage to the lungs is facilitated by a reverse flow of mucosal secretions, although mucociliary action in the respiratory tract is thought to take particles within the mucus out of the lungs. The relatively long persistence in the lungs' lavage, fast clearance from the bile and lack of transport to the saliva of some antibodies suggest the role of mucosal site specific mechanisms.

In a different embodiment, the medicament may be delivered in an aerosol formulation. The aerosol formulation may take the form of a powder, suspension or solution.

The size of aerosol particles is one factor relevant to the delivery capability of an aerosol. Thus, smaller particles may travel further down the respiratory airway towards the alveoli than would larger particles. In one embodiment, the aerosol particles have a diameter distribution to facilitate delivery along the entire length of the bronchi, bronchioles, and alveoli. Alternatively, the particle size distribution may be selected to target a particular section of the respiratory airway, for example the alveoli.

The aerosol particles may be delivered by way of a nebulizer or nasal spray.

In the case of aerosol delivery of the medicament, the particles may have

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diameters in the approximate range of 0.1-50 μm , preferably 1-25 μm , more preferably 1-5 μm .

5 The aerosol formulation of the medicament of the present invention may optionally contain a propellant and/or surfactant.

10 By controlling the size of the droplets which are to be administered to a patient to within the defined range of the present invention, it is possible to avoid/minimise inadvertent antigen delivery to the alveoli and thus avoid alveoli-associated pathological problems such as inflammation and fibrotic scarring of the lungs.

15 I.n. vaccination engages both T and B cell mediated effector mechanisms in nasal and bronchus associated mucosal tissues, which differ from other mucosae-associated lymphoid tissues.

20 The protective mechanisms invoked by the intranasal route of administration may include: the activation of T lymphocytes with preferential lung homing; upregulation of co-stimulatory molecules, eg. B7.2; and/or activation of macrophages or secretory IgA antibodies.

25 Intranasal delivery of antigens may facilitate a mucosal antibody response is invoked which is favoured by a shift in the T cell response toward the Th2 phenotype which helps antibody production. A mucosal response is characterised by enhanced IgA production, and a Th2 response is characterised by enhanced IL-4 production.

30 Intranasal delivery of mycobacterial antigens allows targeting of the antigens to submucosal B cells of the respiratory system. These B cells are the major local IgA-producing cells in mammals and intranasal delivery facilitates a rapid increase in IgA production by these cells against the mycobacterial antigens.

35 In one embodiment administration of the medicament comprising a mycobacterial antigen stimulates IgA antibody production, and the IgA antibody binds to the mycobacterial antigen. In another embodiment, a mucosal and/or Th2 immune response is stimulated.

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In another embodiment monoclonal antibodies, in particular, may be used to raise anti-idiotypic antibodies. Anti-idiotypic antibodies are immunoglobulins which carry an "internal image" of the antigen of the infectious agent against which protection is desired. These anti-idiotypic antibodies may also be useful
5 for treatment, vaccination and/or diagnosis of mycobacterial infections.

According to a ninth aspect of the present invention, the peptides (including fragments, variants, and derivatives thereof) of the present invention and antibodies which bind thereto are useful in immunoassays to detect the
10 presence of antibodies to mycobacteria, or the presence of the virulence associated antigens in biological samples. Design of the immunoassays is subject to a great deal of variation, and many formats are known in the art. The immunoassay may utilize at least one epitope derived from a peptide of the present invention. In one embodiment, the immunoassay uses a combination
15 of such epitopes. These epitopes may be derived from the same or from different bacterial peptides, and may be in separate recombinant or natural peptides, or together in the same recombinant peptides.

An immunoassay may use, for example, a monoclonal antibody directed
20 towards a virulence associated peptide epitope(s), a combination of monoclonal antibodies directed towards epitopes of one mycobacterial antigen, monoclonal antibodies directed towards epitopes of different mycobacterial antigens, polyclonal antibodies directed towards the same antigen, or polyclonal antibodies directed towards different antigens. Protocols may be based, for
25 example, upon competition, or direct reaction, or sandwich type assays. Protocols may also, for example, use solid supports, or may be by immunoprecipitation. Most assays involve the use of labelled antibody or polypeptide; the labels may be, for example, enzymatic, fluorescent, chemiluminescent, radioactive, or dye molecules. Assays which amplify the
30 signals from the probe are also known; examples of which are assays which utilize biotin and avidin, and enzyme-labelled and mediated immunoassays, such as ELISA assays.

Typically, an immunoassay for an antibody(s) to a peptide, will involve selecting
35 and preparing the test sample suspected of containing the antibodies, such as a biological sample, then incubating it with an antigenic (i.e., epitope-containing) peptide(s) under conditions that allow antigen-antibody

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complexes to form, and then detecting the formation of such complexes. The immunoassay may be of a standard or competitive type.

5 The peptide is typically bound to a solid support to facilitate separation of the sample from the peptide after incubation. Examples of solid supports that can be used are nitrocellulose (e.g., in membrane or microtiter well form), polyvinyl chloride (e.g., in sheets or microtiter wells), polystyrene latex (e.g., in beads or microtiter plates, polyvinylidene fluoride (known as Immulon), diazotized paper, nylon membranes, activated beads, and Protein A beads. For example, 10 Dynatech Immulon microtiter plates or 60 mm diameter polystyrene beads (Precision Plastic Ball) may be used. The solid support containing the antigenic peptide is typically washed after separating it from the test sample, and prior to detection of bound antibodies.

15 Complexes formed comprising antibody (or, in the case of competitive assays, the amount of competing antibody) are detected by any of a number of known techniques, depending on the format. For example, unlabelled antibodies in the complex may be detected using a conjugate of antixenogeneic Ig complexed with a label, (e.g., an enzyme label).

20 In immunoassays where the peptides are the analyte, the test sample, typically a biological sample, is incubated with antibodies directed against the peptide under conditions that allow the formation of antigen-antibody complexes. It may be desirable to treat the biological sample to release putative bacterial components prior to testing. Various formats can be employed. For example, 25 a "sandwich assay" may be employed, where antibody bound to a solid support is incubated with the test sample; washed; incubated with a second, labelled antibody to the analyte, and the support is washed again. Analyte is detected by determining if the second antibody is bound to the support. In a competitive 30 format, a test sample is usually incubated with antibody and a labelled, competing antigen is also incubated, either sequentially or simultaneously.

Also included as an embodiment of the invention is an immunoassay kit comprised of one or more peptides of the invention, or one or more antibodies 35 to said peptides, and a buffer, packaged in suitable containers.

As used herein, a "biological sample" refers to a sample of tissue or fluid

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isolated from an individual, including but not limited to, for example, plasma, serum, spinal fluid, lymph fluid, the external sections of the skin, respiratory, intestinal, and genitourinary tracts, tears, saliva, milk, blood cells, tumours, organs, and also samples of in vitro cell culture constituents (including but not
5 limited to conditioned medium resulting from the growth of cells in cell culture medium, putatively virally infected cells, recombinant cells, and cell components).

10 In a related diagnostic assay, the present invention provides nucleic acid probes for detecting a mycobacterial infection.

Using the polynucleotides of the present invention as a basis, oligomers of approximately 8 nucleotides or more can be prepared, either by excision from recombinant polynucleotides or synthetically, which hybridize with the
15 mycobacterial sequences, and are useful in identification of mycobacteria. The probes are a length which allows the detection of the induced or up-regulated sequences by hybridization. While 6-8 nucleotides may be a workable length, sequences of 10-12 nucleotides are preferred, and at least about 20 nucleotides appears optimal. These probes can be prepared using routine
20 methods, including automated oligonucleotide synthetic methods. For use as probes, complete complementarity is desirable, though it may be unnecessary as the length of the fragment is increased.

For use of such probes as diagnostics, the biological sample to be analyzed,
25 such as blood or serum, may be treated, if desired, to extract the nucleic acids contained therein. The resulting nucleic acid from the sample may be subjected to gel electrophoresis or other size separation techniques; alternatively, the nucleic acid sample may be dot blotted without size separation. The probes are usually labeled. Suitable labels, and methods for labeling probes are known in
30 the art, and include, for example, radioactive labels incorporated by nick translation or kinasing, biotin, fluorescent probes, and chemiluminescent probes. The nucleic acids extracted from the sample are then treated with the labeled probe under hybridization conditions of suitable stringencies.

35 The probes may be made completely complementary to the virulence encoding polynucleotide. Therefore, usually high stringency conditions are desirable in order to prevent false positives. The stringency of hybridization is determined

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by a number of factors during hybridization and during the washing procedure, including temperature, ionic strength, length of time, and concentration of formamide.

It may be desirable to use amplification techniques in hybridization assays.
5 Such techniques are known in the art and include, for example, the polymerase chain reaction (PCR) technique.

The probes may be packaged into diagnostic kits. Diagnostic kits include the probe DNA, which may be labelled; alternatively, the probe DNA may be
10 unlabeled and the ingredients for labelling may be included in the kit in separate containers. The kit may also contain other suitably packaged reagents and materials needed for the particular hybridization protocol, for example, standards, as well as instructions for conducting the test.

15 In a preferred embodiment, a peptide (or fragment or variant or derivative) of the present invention is used in a diagnostic assay to detect the presence of a T-lymphocyte which T lymphocyte has been previously exposed to an antigenic component of a mycobacterial infection in a patient.

20 In more detail, a T-lymphocyte which has been previously exposed to a particular antigen will be activated on subsequent challenge by the same antigen. This activation provides a means for identifying a positive diagnosis of mycobacterial infection. In contrast, the same activation is not achieved by a T-lymphocyte which has not been previously exposed to the particular antigen.

25 The above "activation" of a T-lymphocyte is sometimes referred to as a "recall response" and may be measured, for example, by determining the release of interferon (eg. IFN- γ) from the activated T-lymphocyte. Thus, the presence of a mycobacterial infection in a patient may be determined by the release of a
30 minimum concentration of interferon from a T-lymphocyte after a defined time period following *in vitro* challenge of the T-lymphocyte with a peptide (or fragment or variant or derivative) of the present invention.

In use, a biological sample containing T-lymphocytes is taken from a patient,
35 and then challenged with a peptide (or fragment, variant, or derivative thereof) of the present invention.

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The above T-lymphocyte diagnostic assay may include an antigen presenting cell (APC) expressing at least one major histocompatibility complex (MHC) class II molecule expressed by the patient in question. The APC may be inherently provided in the biological sample, or may be added exogenously. In one
5 embodiment, the T-lymphocyte is a CD4 T-lymphocyte.

Brief mention is now made to the Figures of the present application, in which:-

Fig. 1 illustrates the viable counts for *M. tuberculosis* during culture under
10 batch fermentation conditions at a DOT of 50 % air saturation (37 °C); and

Fig. 2 illustrates the concentration of glycerol (as the primary carbon and energy source during culture of *M. tuberculosis* under batch fermentation conditions at a DOT of 50 % air saturation (37 °C).
15

Fig. 3 illustrates the DOT within the medium of the mycobacterial culture described in Example 18.

Fig. 4 illustrates the viable counts for *M. tuberculosis* during the batch
20 fermentation conditions of Example 18 (ie. carbon-starvation, and oxygen limiting conditions).

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Example 1 - culture of mycobacteria

Two alternative mycobacterial culture methods have been employed to study genes which are up-regulated or induced during mycobacterial latency.

5

Model 1 - *in vitro* model of mycobacterial persistence under aerobic, nutrient-starved conditions**Materials and Methods**

10

Strain

Studies were performed with *M. tuberculosis* strain H37Rv (NCTC cat. no. 7416) - a representative strain of *M.tuberculosis*. Stock cultures were grown on Middlebrook 7H10 + OADC for 3 weeks at $37 \pm 2^{\circ}\text{C}$.

15

Culture Medium

20

Persistence cultures were established in Middlebrook 7H9 medium supplemented with Middlebrook ADC enrichment, 0.2% Tween 80 and 0.2% glycerol (Table 1). The medium was prepared with high quality water from a Millipore water purification system and filter sterilised by passage through a 0.1 μm pore size cellulose acetate membrane filter capsule (Sartorius Ltd). The pH was adjusted to 6.6 with concentrated hydrochloric acid.

25

Middlebrook 7H10 + OADC agar was used to prepare inoculum cultures, enumerate the number of culturable bacteria in samples, and to assess culture purity.

Culture system

30

We previously developed a process for the culture of mycobacteria under controlled and defined conditions - patent application No. PCT/GB00/00760 (WO00/52139). We used this culture system operated as a batch fermenter for the following studies of mycobacterial persistence.

35

Culture experiments were performed in a one litre glass vessel operated at a working volume of 750 ml. The culture was agitated by a magnetic bar placed in the culture vessel coupled to a magnetic stirrer positioned beneath the vessel. Culture conditions were continuously monitored by an Anglicon Microlab Fermentation System (Brighton Systems, Newhaven), linked to sensor

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probes inserted into the culture through sealed ports in the top plate. The oxygen concentration was monitored with a galvanic oxygen electrode (Uniprobe, Cardiff) and was controlled through sparging the culture with a mixture of air and oxygen free-nitrogen. Temperature was monitored by an Anglicon temperature probe, and maintained by a heating pad positioned beneath the culture vessel. Culture pH was measured using an Ingold pH electrode (Mettler-Toledo, Leicester).

Inoculation and culture

The vessel was filled with 750 ml of sterile culture medium and parameters were allowed to stabilise at $37\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, $\text{pH } 6.9 \pm 0.3$ and a dissolved oxygen tension of approximately 70 % air saturation. A dense inoculum suspension was prepared by resuspending Middlebrook agar cultures, grown at $37\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 3 weeks, in sterile deionised water. The inoculum was aseptically transferred to the culture vessel, to provide an initial culture turbidity of approximately 0.25 at 540 nm.

The culture were maintained at $37\text{ }^{\circ}\text{C}$ with an agitation rate of 500 to 750 rpm. The dissolved oxygen tension was maintained between 50 - 70% air saturation with the aid of culture sparging. The initial culture pH was set at approximately 6.7 and was monitored through-out the experiment.

The culture was maintained for 50 days and samples were removed regularly to monitor growth and survival, nutrient utilisation and gene expression.

Growth and survival

Bacterial growth and survival was assessed by determining the number of viable cells in the culture system at specific time points. This was achieved by preparing a decimal dilution series of the sample in sterile water and plating 100 μl aliquots onto Middlebrook 7H10 + OADC plates. The plates were incubated at $37\text{ }^{\circ}\text{C}$ for up to 4 weeks before enumerating the number of colonies formed.

Nutrient utilisation

Glycerol is the primary carbon and energy source present in Middlebrook 7H9 medium with ADC, 0.2 % Tween and 0.2 % Glycerol. The rate at which glycerol was utilised was determined using the Glycerol Determination Kit Cat. No. 148 270 Boehringer Mannheim.

Microarray experiments

RNA was extracted from culture samples collected at different time points during the experiment. A fluorescently-labelled cDNA was then transcribed from each sample of RNA. The cDNA was labelled by the incorporation of either Cy3 or Cy5 labelled dCTP (Dyes are supplied by Amersham Pharmacia Biotech).

Whole *M. tuberculosis* genome arrays were prepared from *M. tuberculosis* genomic DNA using ORF-specific primers. PCR products corresponding to each ORF were spotted in a grid onto a standard glass microscope slide using a BioRobotics microgrid robot (MWG Biotech) at a resolution of >4000 spots/cm².

In each microarray experiment a whole genome array was hybridised with labelled cDNA from one culture sample (Test sample). Each array was also hybridised with control DNA incorporating a different Cy dye and prepared from DNA extracted from *M. tuberculosis* strain H37Rv (control sample).

Each array was scanned at two different wavelengths corresponding to the excitation maxima of each dye and the intensity of the emitted light was recorded. The ration of the intensity values for the test and control samples was determined for each array.

The slides were scanned using an Affymetrix 428 scanner. The raw data was initially analysed by ImaGene software. The scanned images were then transferred to another software package known as GeneSpring to analyse the expression of each gene.

Results

After inoculation the culture entered exponential growth and continued to grow exponentially until 10 days after inoculation (see Fig. 1). Cessation of exponential growth coincided with depletion of the primary carbon and energy source - glycerol (see Fig. 2). As the culture entered stationary phase, viability started to decline and continued to decline steadily over the duration of the study. After 40 days in stationary phase, approximately 1 % of the culture was still culturable on Middlebrook agar.

The gene expression profiles for samples collect at day 5 and day 50 were

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compared. Three arrays were prepared for each sample and the ratio of the intensity values for the test and control samples was determined for each array.

Two different approaches were used to analyse the data:-

5

1. The ratio values for the 3 arrays prepared for each sample were averaged and compared. Genes which produced intensity ratios that were 3-fold higher on day 50 than on day 5 were selected.

10

2. Data from each array was treated as a separate data set and self-organising maps were used to select all the genes that were consistently up-regulated in all 3 arrays at day 50 relative to day 5.

15

The two data sets were then compared and those genes that were at least 1.5-fold, preferably at least 3-fold up-regulated at day 50, relative to exponential growth at day 5, and which were consistently up-regulated in all 3 arrays (experiments) were selected. The identified sequences (protein, followed by nucleic acid) are presented in Table 2.

20

Model 2 - *in vitro* model of mycobacterial persistence under low oxygen, and nutrient-starved conditions

25

A second model which simulated low-oxygen availability and nutrient depletion has also been developed. This model was established as outlined for Model 1 above, but with the following modifications.

30

After inoculation, the dissolved oxygen tension (DOT) of the culture was maintained at approximately 40% air saturation at 37 °C until the culture had entered early exponential growth. The DOT was then lowered in increments down to 1% air saturation over a six day period. The culture was then maintained at a DOT of 0 - 5% until 50 days after inoculation. Samples were collected for analysis, and the identified sequences (protein, followed by nucleic acid) are presented in Table 2.

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Table 1 - liquid medium formulation for persistence cultures - Middlebrook 7H9 medium supplemented with ADC, 0.2% Tween 80 and 0.2% Glycerol

<u>Composition per litre</u>		
5	Na ₂ HPO ₄	2.5 g
	KH ₂ PO ₄	1.0 g
	Monosodium glutamate	0.5 g
	(NH ₄) ₂ SO ₄	0.5 g
10	Sodium citrate	0.1 g
	MgSO ₄ .7H ₂ O	0.05 g
	Ferric ammonium citrate	0.04 g
	CuSO ₄ .5H ₂ O	1.0 mg
	Pyridoxine	1.0 mg
15	ZnSO ₄ .7H ₂ O	1.0 mg
	Biotin	0.5 mg
	CaCl ₂ .2H ₂ O	0.5 mg
	Middlebrook ADC enrichment	100 ml
20	Glycerol	2.0 ml
	Tween 80	2.0 ml
Middlebrook ADC enrichment - per 100 ml		
25	Bovine serum albumin	5.0 g
	Glucose	2.0 g
	Catalase	3.0 mg

Example 2 - RNA extraction from *M. tuberculosis* for microarray analysis**Materials and Methods**

Trizol (Life Technologies)- formulation of phenol and guanidine thiocyanate.

5

GTC lysis solution containing: 5 M guanidine thiocyanate, 0.5 % N-lauryl sarcosine, 25 mM tri-sodium citrate, 0.1 M 2-mercaptoethanol, and 0.5 % Tween 80.

10

Chloroform

Isopropanol

3M sodium acetate

70 % Ethanol

microfuge

15

ribolyser

Sterile plasticware-Falcon tubes, screw capped eppendorfs, gilson tips –all RNase free

20

Glassware – baked at 160 °C for at least 16 hours

Method

Steps performed at Containment level 3; within a Class III microbiological safety cabinet.

25

Remove 10 or 20 ml of culture (10^9 /ml) and immediately add this to 4 volumes of GTC lysis buffer in a plastic specimen pot. Seal the pot tightly.

30

Incubate the cells in GTC lysis buffer for 1 hour at room temperature. Surface decontaminate the plastic pot with 5 % Hycolin for 5 minutes. Transfer the sample to the pass box and place it into a plastic carry tin with a sealable lid. Close the container securely and transport it to a non-toxic cabinet CL3 cabinet.

35

Equally distribute the lysis mixture between Falcon tubes. Place these tubes into centrifuge buckets and seal the buckets tightly. Surface-decontaminate the buckets for 5 minutes with 5 % Hycolin. Then transfer them to the centrifuge (Baird and Tatlock Mark IV refrigerated bench-top centrifuge). Spin the tubes at

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3,000 rpm for 30 minutes.

Return the unopened buckets to the cabinet. Remove the centrifuge tubes and pour the supernatant into a waste bottle for GTC lysis buffer.

5

Resuspend each pellet in 1 ml of Trizol (formulation of phenol and GTC cat no. 15596-026). The manufacturers guidelines recommend lysing cells by repetitive pipetting. Although this action alone will not lyse *M. tuberculosis*, it is important to completely resuspend the pellet in Trizol.

10

Transfer 1 ml of cells into a FastRNA tube and ribolyse it at power setting 6.5 for 45 seconds.

Leave the tube to incubate at room temperature for 5 minutes.

15

Remove the aqueous layer from the tube and add this to 200 μ l of chloroform in a screw-capped eppendorf tube. Shake each tube vigorously for about 15 seconds. Incubate for 2-3 minutes at room temperature.

20

Spin the tube at 13,000 rpm for 15 minutes. Following centrifugation, the liquid separates into red phenol/chloroform phase, an interface, and a clear aqueous phase.

25

Carefully remove the aqueous phase and transfer it to a fresh eppendorf tube containing 500 μ l of chloroform/isoamyl alcohol (24:1). Spin the tubes at 13,000 rpm for 15 minutes.

30

Transfer the aqueous phase to an eppendorf tube containing 50 μ l of sodium acetate and 500 μ l of isopropanol.

Surface decontaminate the eppendorf tube with 5% Hycolin for 5 minutes. Remove the tube from the CL3 laboratory and continue with the procedure in laboratory 157.

35

Steps performed at Containment level 2:

Precipitate the RNA at -70 °C for at least 30 minutes-can do this step overnight.

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Spin the precipitated RNA down at 13,000 rpm for 10 minutes. Remove the supernatant and wash the pellet in 70 % ethanol. Repeat centrifugation.

5 Remove the 70 % ethanol and air-dry the pellet. Dissolve the pellet in RNase free water.

Freeze the RNA at -70 °C to store it.

10 **Example 3 - isolation of genomic DNA from *Mycobacterium tuberculosis* grown in chemostat culture. DNA then used to generate Cy3 or Cy5 labelled DNA for use as a control in microarray experiments.**

Materials and Methods

Beads 0.5 mm in diameter
15 Bead beater
Bench top centrifuge
Platform rocker
Heat block
Falcon 50 ml centrifuge tubes
20 Sorvall RC-5C centrifuge
250 ml polypropylene centrifuge pots.
Screw capped eppendorf tubes
Pipettes 1 ml, 200 μ l, 10 ml, 5 ml

25 Breaking buffer
50 mM Tris HCl pH 8.0
10 mM EDTA
100 mM NaCl

30 Procedure

Mechanical disruption of *M. tuberculosis* cells

* 150 ml of chemostat cells (O.D of 2.5 at 540 nm) are spun down at 15,000 rpm for 15 minutes in 250 ml polypropylene pots using centrifuge Sorvall RC-5C.
35 * The supernatant is discarded.
* Cells are re-suspended in 5 ml of breaking buffer in a 50 ml Falcon tube and centrifuged at 15,000 rpm for a further 15 minutes.

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- * The supernatant is removed and additional breaking buffer is added at a volume of 5 ml. Beads are used to disrupt the cells. These are used at a quantity of 1ml of beads for 1 ml of cells. Place the sample into the appropriate sized chamber. Place in the bead beater and secure the outer unit (containing ice) and process at the desired speed for 30 seconds.
- * Allow the beads to settle for 10 minutes and transfer cell lysate to a 50 ml Falcon centrifuge tube
- * Wash beads with 2-5 ml of breaking buffer by pipetting washing buffer up and down over the beads.
- * Add this washing solution to the lysate in the falcon tube

Removal of proteins and cellular components

- * Add 0.1 volumes of 10% SDS and 0.01 volumes proteinase K.
- * Mix by inversion and heat at 55 °C in a heat block for 2-3 hours
- * The resulting mix should be homogenous and viscous. Additional SDS may be added to assist here to bring the concentration up to 0.2 %
- * Add an equal volume of phenol/chloroform/Isoamyl alcohol in the ratio: 25/24/1.
- * Gently mix on a platform rocker until homogenous
- * Spin down at 3,000 rpm for 20 minutes
- * Remove the aqueous phase and place in a fresh tube
- * Extract the aqueous phase with an equal volume of chloroform to remove traces of cell debris and phenol. Chloroform extractions may need to be repeated to remove all the debris.
- * Precipitate the DNA with 0.3 M sodium acetate and an equal volume of isopropanol.
- * Spool as much DNA as you can with a glass rod
- * Wash the spooled DNA in 70 % ethanol followed by 100 % ethanol
- * Leave to air dry
- * Dissolve the DNA in sterile deionised water (500 µl)
- * Allow DNA to dissolve at 4 °C for approximately 16 hours.
- * Add RNase 1 (500U) to the dissolved DNA
- * Incubate for 1 hour at 37 °C.
- * Re-extract with an equal volume of phenol/chloroform followed by a chloroform extraction and precipitate as before
- * Spin down the DNA at 13,000 rpm
- * Remove the supernatant and wash the pellet in 70% ethanol

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- * Air dry
- * Dissolve in 200-500 μ l of sterile water.

Example 4 - preparation of Cy3 or Cy5 labelled DNA from DNA

5

a) Prepare one Cy3 or one Cy5 labelled DNA sample per microarray slide.

Each sample:

	DNA	2-5 μ g
	Random primers (3 μ g/ μ l)	1 μ l
10	H ₂ O	to 41.5 μ l

Heat at 95 °C for 5 min, snap cool on ice and briefly centrifuge.

Add to each:

15	10 x REact 2 buffer	5 μ l
	dNTPs (5mM dA/G/TTP, 2 mM dCTP).....	1 μ l
	Cy3 OR Cy5 dCTP.....	1.5 μ l
	Klenow (5U/ μ l)	1 μ l
	Incubate at 37 °C in dark for 90 min.	

20

b) Prehybridise slide

Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the labelling reaction to equilibrate.

	Prehybridisation: 20 x SSC.....	8.75 ml (3.5 x SSC)
25	20% SDS	250 μ l (0.1% SDS)
	BSA (100 mg/ml).....	5 ml (10 mg/ml)
	H ₂ O	to 50 ml

Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in 400 ml propan-2-ol for 1 min and centrifuge slide in 50 ml centrifuge tube at 1,500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation (<1h).

c) Purify Cy3/Cy5 labelled DNA - Qiagen MinElute Purification

- * Combine Cy3 and Cy5 labelled DNA samples in single tube and add 500 μ l Buffer PB.

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- * Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 500 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 250 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.
- * Place the MinElute column into a fresh 1.5 ml tube.
- * Add 10.5 μ l H₂O to the centre of the membrane and allow to stand for 1 min.
- * Centrifuge at 13,000 rpm for 1 min.

15 Example 5 - preparation of Cy3 or Cy5 label cDNA from RNA

a) Prepare one Cy3 and one Cy5 labelled cDNA sample per microarray slide

Each sample:

- | | |
|--|---------------|
| RNA | 2-10 μ g |
| 20 Random primers (3 μ g/ μ l) | 1 μ l |
| H ₂ O | to 11 μ l |

Heat at 95 °C for 5min, snap cool on ice and briefly centrifuge.

- | | |
|---|-------------|
| Add to each: 5 \times First Strand Buffer | 5 μ l |
| 25 DTT (100 mM)..... | 2.5 μ l |
| dNTPs (5 mM dA/G/TTP, 2 mM dCTP)..... | 2.3 μ l |
| Cy3 OR Cy5 dCTP..... | 1.7 μ l |
| SuperScript II (200 U/ μ l)..... | 2.5 μ l |

- 30 Incubate at 25 °C in dark for 10 min followed by 42 °C in dark for 90 min.

b) Prehybridise slide

Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the labelling

- 35 reaction to equilibrate.

Prehybridisation:

20 x SSC 8.75 ml (3.5 x SSC)

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20% SDS 250 μ l (0.1 % SDS)
 BSA (100 mg/ml)..... 5 ml (10 mg/ml)
 H₂O to 50 ml

5 Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in 400 ml propan-2-ol for 1min and centrifuge slide in 50 ml centrifuge tube at 1500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation (< 1h).

10 c) Purify Cy3/Cy5 labelled cDNA - Qiagen MinElute Purification

* Combine Cy3 and Cy5 labelled DNA samples in single tube and add 250 μ l Buffer PB.

* Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.

15 * Discard flow-through and place MinElute column back into same collection tube.

* Add 500 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.

* Discard flow-through and place MinElute column back into same collection tube.

20 min. * Add 250 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.

* Discard flow-through and place MinElute column back into same collection tube.

* Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.

* Place the MinElute column into a fresh 1.5 ml tube.

* Add 10.5 μ l H₂O to the centre of the membrane and allow to stand for 1 min.

25 * Centrifuge at 13,000 rpm for 1 min.

Example 6 - hybridise slide with Cy3/Cy5 labelled cDNA

30 Place the prehybridise microarray slide in the hybridisation cassette and add two 15 ml aliquots of H₂O to the wells in the cassette. Mix resuspended Cy3/Cy5 labelled cDNA sample with hybridisation solution.

Hybridisation: Cy3/Cy5 labelled cDNA sample.....10.5 ml

20xSSC3.2 ml (4 x SSC)

35 2% SDS.....2.3 ml (0.3% SDS)

Heat hybridisation solution at 95 °C for 2 min. Do not snap cool on ice but allow

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to cool slightly and briefly centrifuge. Pipette the hybridisation solution onto the slide at the edge of the arrayed area avoiding bubble formation. Using forceps carefully drag the edge of a cover slip along the surface of the slide towards the arrayed area and into the hybridisation solution at the edge of the array. Carefully lower the cover slip down over the array avoiding any additional movement once in place. Seal the hybridisation cassette and submerge in a water bath at 60 °C for 16-20 h.

Wash slide.

Remove microarray slide from hybridisation cassette and initially wash slide carefully in staining trough of Wash A to remove cover slip. Once cover slip is displaced place slide(s) in slide rack and continue agitating in Wash A for a further 2 min.

Wash A: 20xSSC.....20 ml (1 x SSC)
 20% SDS.....1 ml (0.05% SDS)
 H₂O.....to 400 ml

Transfer slide(s) to a clean slide rack and agitate in first trough of Wash B for 2 min. Wash in second trough of Wash B with agitation for 2 min.

Wash B (x2):20xSSC.....1.2 ml (0.06 x SSC)
 H₂O.....to 400 ml

Place slide into a 50 ml centrifuge tube and centrifuge at 1500 rpm for 5 mins to dry slide, and then scan fluorescence using a ScanArray 3000 dual-laser confocal scanner and analyse data.

Example 7 - preparation of the arrays

PCR-amplified products are generated from *M. tuberculosis* genomic DNA using ORF-specific primers. Each gene of the genome is represented. These are spotted in a grid onto a standard glass microscope slide using a BioRobotics microgrid robot (MWG Biotech) at a resolution of >4000 spots/cm².

Example 8 - scanning and analysis of data

The slides were scanned using an Affymetrix 428 scanner.

Dual fluorescence is used, allowing simultaneous detection of two cDNA samples. The output of the arrays is read using a confocal laser scanner (Affymetrix 428 scanner from MWG Biotech). More detailed information can be found web site www.sghms.ac.uk/depts/medmicro/bugs; Mujumdar, R.B. (1993) Bioconjugate Chemistry, 4(2), pp.105-111; Yu, H. (1994) Nucl. Acids Res. 22, pp.3226-3232; and Zhu, Z. (1994) Nucl. Acids Res. 22, pp. 3418-3422.

The raw data were initially analysed in software known as ImaGene, which was supplied with the scanner. The scanned images were then transferred to another software package known as GeneSpring. This is a very powerful tool, which draws information from many databases allowing the complete analysis of the expression of each gene.

Example 9 - delete one or more of the genes from *M. tuberculosis* in order to attenuate its virulence while retaining immunogenicity

One or more genes that are identified may be disrupted using allelic exchange. In brief, the gene of interest is cloned with 1-2 kb of flanking DNA either side and is inactivated by deletion of part of the coding region and insertion of an antibiotic resistance marker, such as hygromycin.

The manipulated fragment is then transferred to a suitable suicide vector e.g. pPR23 and is transformed into the wild-type parent strain of *M. tuberculosis*. Mutants are recovered by selecting for antibiotic resistant strains. Genotypic analysis (Southern Blotting with a fragment specific to the gene of interest) is performed on the selected strains to confirm that the gene has been disrupted.

The mutant strain is then studied to determine the effect of the gene disruption on the phenotype. In order to use it as a vaccine candidate it would be necessary to demonstrated attenuated virulence. This can be done using either a guinea pig or mouse model of infection. Animals are infected with the mutant strain and the progression of disease is monitored by determining the bacterial load in different organs, in particular the lung and spleen, at specific time points post infection, typically up to 16 weeks.

Comparison is made to animals infected with the wild-type strain which should have a significantly higher bacterial load in the different organs. Long-term survival studies and histopathology can also be used to assess virulence and pathogenicity.

5

Once attenuated virulence has been established, protection and immunogenicity studies can be performed to assess the potential of the strain as a vaccine. Suitable references for allelic exchange and preparation of TB mutants are McKinney et al., 2000 and Pelicic et al., 1997, [1, 2].

10

Example 10 - select one or more of the genes identifiable by the present invention, which encode proteins that are immunogenic, and put them into BCG or an attenuated strain of *M. tuberculosis* to enhance its overall immunogenicity

15

The gene of interest is amplified from the *M. tuberculosis* genome by PCR. The amplified product is purified and cloned into a plasmid (pMV306) that integrates site specifically into the mycobacterial genome at the attachment site (attB) for mycobacteriophage L5 [3].

20

BCG is transformed with the plasmid by electroporation, which involves damaging the cell envelope with high voltage electrical pulses, resulting in uptake of the DNA. The plasmid integrates into the BCG chromosome at the attB site generating stable recombinants. Recombinants are selected and are checked by PCR or Southern blotting to ensure that the gene has been integrated. The recombinant strain is then used for protection studies.

25

Example 11 - Use of recombinant carriers such as attenuated salmonella and the Vaccinia virus to express and present TB genes.

30

One of the best examples of this type of approach is the use of Modified Vaccinia virus Ankara (MVA) [4]. The gene of interest is cloned into a vaccinia virus shuttle vector, e.g. pSC11. Baby Hamster Kidney (BHK) cells are then infected with wild-type MVA and are transfected with the recombinant shuttle vector. Recombinant virus is then selected using a suitable selection marker and viral plaques, selected and purified.

35

Recombinant virus is normally delivered as part of a prime-boost regime where animals are vaccinated initially with a DNA vaccine encoding the TB genes of interest under the control of a constitutive promoter. The immune response is boosted by administering recombinant MVA carrying the genes of interest to the animals at least 2 weeks later.

Example 12 - Sub-unit vaccines containing a single peptide/protein or a combination of proteins

To prepare sub-unit vaccines with one or more peptides or proteins it is first of all necessary to obtain a supply of protein or peptide to prepare the vaccine. Up to now, this has mainly been achieved in mycobacterial studies by purifying proteins of interest from TB culture. However, it is becoming more common to clone the gene of interest and produce a recombinant protein.

The coding sequence for the gene of interest is amplified by PCR with restriction sites inserted at the N terminus and C terminus to permit cloning in-frame into a protein expression vector such as pET-15b. The gene is inserted behind an inducible promoter such as lacZ. The vector is then transformed into *E. coli* which is grown in culture. The recombinant protein is over-expressed and is purified.

One of the common purification methods is to produce a recombinant protein with an N-terminal His-tag. The protein can then be purified on the basis of the affinity of the His-tag for metal ions on a Ni-NTA column after which the His-tag is cleaved. The purified protein is then administered to animals in a suitable adjuvant [5].

Example 13 - Plasmid DNA vaccines carrying one or more of the identified genes

DNA encoding a specific gene is amplified by PCR, purified and inserted into specialised vectors developed for vaccine development, such as pVAX1. These vectors contain promoter sequences, which direct strong expression of the introduced DNA (encoding candidate antigens) in eukaryotic cells (e.g. CMV or SV40 promoters), and polyadenylation signals (e.g. SV40 or bovine growth hormone) to stabilise the mRNA transcript.

The vector is transformed into *E. coli* and transformants are selected using a

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marker, such as kanamycin resistance, encoded by the plasmid. The plasmid is then recovered from transformed colonies and is sequenced to check that the gene of interest is present and encoded properly without PCR generated mutations.

5

Large quantities of the plasmid is then produced in *E. coli* and the plasmid is recovered and purified using commercially available kits (e.g. Qiagen Endofree-plasmid preparation). The vaccine is then administered to animals for example by intramuscular injection in the presence or absence of an adjuvant.

10

Example 14 - Preparation of DNA expression vectors

DNA vaccines consist of a nucleic acid sequence of the present invention cloned into a bacterial plasmid. The plasmid vector pVAX1 is commonly used in the preparation of DNA vaccines. The vector is designed to facilitate high copy number replication in *E. coli* and high level transient expression of the peptide of interest in most mammalian cells (for details see manufacturers protocol for pVAX1 (catalog No. V260-20 www.invitrogen.com) ..

15

20 The vector contains the following elements:-

- * Human cytomegalovirus immediate-early (CMV) promoter for high-level expression in a variety of mammalian cells

- * T7 promoter/priming site to allow *in vitro* transcription in the sense orientation and sequencing through the insert

25 * Bovine growth hormone (BGH) polyadenylation signal for efficient transcription termination and polyadenylation of mRNA

- * Kanamycin resistance gene for selection in *E. coli*

- * A multiple cloning site

- * pUC origin for high-copy number replication and growth in *E. coli*

30 * BGH reverse priming site to permit sequencing through the insert

Vectors may be prepared by means of standard recombinant techniques which are known in the art, for example Sambrook et al., (1989). Key stages in preparing the vaccine are as follows:

35

- * The gene of interest is ligated into pVAX1 via one of the multiple cloning sites

- * The ligation mixture is then transformed into a competent *E. coli* strain (e.g.

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TOP10) and LB plates containing 50µg/ml kanamycin are used to select transformants.

* Clones are selected and may be sequenced to confirm the presence and orientation of the gene of interest.

5 * Once the presence of the gene has been verified, the vector can be used to transfect a mammalian cell line to check for protein expression. Methods for transfection are known in the art and include, for example, electroporation, calcium phosphate, and lipofection.

10 * Once peptide expression has been confirmed, large quantities of the vector can be produced and purified from the appropriate cell host, e.g. *E. coli*.

pVAX1 does not integrate into the host chromosome. All non-essential sequences have been removed to minimise the possibility of integration. When constructing a specific vector, a leader sequence may be included to direct secretion of the
15 encoded protein when expressed inside the eukaryotic cell.

Other examples of vectors that have been used are V1Jns.tPA and pCMV4 (Lefevre *et al.*, 2000 and Vordermeier *et al.*, 2000).

20 Expression vectors may be used that integrate into the genome of the host, however, it is more common and more preferable to use a vector that does not integrate. The example provided, pVAX1, does not integrate. Integration would lead to the generation of a genetically modified host which raises other issues.

25 **Example 15 - RNA vaccine**

As discussed on page 15 of US patent US5,783,386, one approach is to introduce RNA directly into the host.

30 Thus, the vector construct (Example 10) may be used to generate RNA *in vitro* and the purified RNA then injected into the host. The RNA would then serve as a template for translation in the host cell. Integration would not occur.

Another option is to use an infectious agent such as the retroviral genome
35 carrying RNA corresponding to the gene of interest. Here you will get integration into the host genome

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Another option is the use of RNA replicon vaccines which can be derived from virus vectors such as Sindbis virus or Semliki Forest virus. These vaccines are self-replicating and self-limiting and may be administered as either RNA or DNA which is then transcribed into RNA replicons *in vivo*. The vector eventually causes lysis of the transfected cells thereby reducing concerns about integration into the host genome. Protocols for RNA vaccine construction are detailed in Cheng *et al.*, (2001).

Example 16 - Diagnostic assays based on assessing T cell responses

10

For a diagnostic assay based on assessing T cell responses it would be sufficient to obtain a sample of blood from the patient. Mononuclear cells (monocytes, T and B lymphocytes) can be separated from the blood using density gradients such as Ficoll gradients.

15

Both monocytes and B-lymphocytes are both able to present antigen, although less efficiently than professional antigen presenting cells (APCs) such as dendritic cells. The latter are more localised in lymphoid tissue.

20

The simplest approach would be to add antigen to the separated mononuclear cells and incubate for a week and then assess the amount of proliferation. If the individual had been exposed to the antigen previously through infection, then T-cell clones specific to the antigen should be more prevalent in the sample and should respond.

25

It is also possible to separate the different cellular populations should it be desired to control the ratio of T cells to APC's.

30

Another variation of this type of assay is to measure cytokine production by the responding lymphocytes as a measure of response. The ELISPOT assay described below in Example 17 is a suitable example of this variation.

Example 17 - detection of latent mycobacteria

35

A major problem for the control of tuberculosis is the presence of a large reservoir of asymptomatic individuals infected with tubercle bacilli. Dormant bacilli are more resistant to front-line drugs.

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The presence of latent mycobacteria-associated antigen may be detected indirectly either by detecting antigen specific antibody or T-cells in blood samples.

The following method is based on the method described in Lalvani *et al.* (2001) in which a secreted antigen, ESAT-6, was identified as being expressed by members of the *M. tuberculosis* complex but is absent from *M. Bovis* BCG vaccine strains and most environmental mycobacteria. 60 - 80% of patients also have a strong cellular immune response to ESAT-6. An *ex-vivo* ELISPOT assay was used to detect ESAT-6 specific T cells.

As applied to the present invention:

A 96 well plate is coated with cytokine (e.g. interferon- γ , IL-2) -specific antibody. Peripheral blood monocytes are then isolated from patient whole blood and are applied to the wells.

Antigen (ie. one of the peptides, fragments, derivatives or variants of the present invention) is added to stimulate specific T cells that may be present and the plates are incubated for 24h. The antigen stimulates cytokine production which then binds to the specific antibody.

The plates are washed leaving a footprint where antigen-specific T cells were present.

A second antibody coupled with a suitable detection system, e.g. enzyme, is then added and the number of spots are enumerated after the appropriate substrate has been added.

The number of spots, each corresponding to a single antigen-specific T cell, is related to the total number of cells originally added.

The above Example also describes use of an antigen that may be used to distinguish TB infected individuals from BCG vaccinated individuals. This could be used in a more discriminative diagnostic assay.

Example 18 -*In vitro* model for mycobacterial persistence under the joint conditions of carbon-starvation and oxygen-limitation (a variation on Examples 1-7)

Materials and Methods

Strain

Studies were performed with *M. tuberculosis* strain H37Rv (NCTC cat. No. 7416) - a representative strain of *M. tuberculosis*. Stock cultures were grown on Middlebrook 7H10 + OADC for 3 weeks at 37 ± 2 °C.

Culture Medium

Persistence cultures were established in Middlebrook 7H9 medium supplemented with Middlebrook ADC enrichment, 0.2 % Tween 80 and 0.2 % glycerol (see below). The medium was prepared with high quality water from a Millipore water purification system and filter sterilised by passage through a 0.1 µm pore size cellulose acetate membrane filter capsule (Sartorius Ltd). The pH was adjusted to 6.6 with concentrated hydrochloric acid.

Middlebrook 7H10 + OADC agar was used to prepare inoculum cultures, enumerate the number of culturable bacteria in samples, and to assess culture purity.

Culture system

The culture system described in WO00/52139, operated as a batch fermenter, was employed for this Example.

Culture experiments were performed in a one litre glass vessel operated at a working volume of 750 ml. The culture was agitated by a magnetic bar placed in the culture vessel coupled to a magnetic stirrer positioned beneath the vessel. Culture conditions were continuously monitored by an Anglicon Microlab Fermentation System (Brighton Systems, Newhaven), linked to sensor probes inserted into the culture through sealed ports in the top plate. The oxygen concentration was monitored with a galvanic oxygen electrode (Uniprobe, Cardiff) and was controlled through sparging the culture with a mixture of air and oxygen free-nitrogen. Temperature was monitored by an Anglicon temperature probe, and maintained by a heating pad positioned beneath the culture vessel. Culture pH was measured using an Ingold pH electrode (Mettler-Toledo, Leicester).

Inoculation and culture

The vessel was filled with 750 ml of sterile culture medium and parameters were allowed to stabilise at 37 °C \pm 2 °C, pH 6.9 ± 0.3 and a dissolved oxygen

tension of approximately 70 % air saturation. A dense inoculum suspension was prepared by resuspending Middlebrook agar cultures, grown at 37 ± 2 °C for 3 week, in sterile deionised water. The inoculum was aseptically transferred to the culture vessel, to provide an initial culture turbidity of approximately 0.25 at 540 nm. The culture was maintained at 37 °C with an agitation rate of 500 to 750 rpm.

After inoculation, the dissolved oxygen tension (DOT) of the culture was maintained at approximately 40% air saturation at 37 °C until the culture had entered early exponential growth. The DOT was then lowered in increments down to 1 % air saturation over a six day period (Fig. 3). The culture was then maintained at a DOT of 0 - 5 % until 50 days after inoculation and samples were removed regularly to monitor growth and survival, nutrient utilisation and gene expression.

Growth and survival

Bacterial growth and survival was assessed by determining the number of viable cells in the culture system at specific time points. This was achieved by preparing a decimal dilution series of the sample in sterile water and plating 100(µl aliquots onto Middlebrook 7H10 + OADC plates. The plates were incubated at 37 °C for up to 4 weeks before enumerating the number of colonies formed.

Nutrient utilisation

Glycerol is the primary carbon and energy source present in Middlebrook 7H9 medium with ADC, 0.2 % Tween and Glycerol. The rate at which glycerol was utilised was determined using the Glycerol Determination Kit Cat. No. 148 270 Boehringer Mannheim.

Microarray experiments

RNA was extracted from culture samples collected at different time points during the experiment. A fluorescently-labelled cDNA was then transcribed from each sample of RNA. The cDNA was labelled by the incorporation of either Cy3 or Cy5 labelled dCTP (Dyes are supplied by Amersham Pharmacia Biotech).

Whole *M. tuberculosis* genome arrays were prepared from *M. tuberculosis* genomic DNA using ORF-specific primers. PCR products corresponding to each ORF were spotted in a grid onto a standard glass microscope slide using a BioRobotics microgrid robot (MWG Biotech) at a resolution of > 4000 spots/cm².

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Arrays were supplied by Dr P Butcher, St George's Hospital Medical School London.

5 In each microarray experiment a whole genome array was hybridised with labelled cDNA from one culture sample (Test sample). Each array was also hybridised with control DNA incorporating a different Cy dye and prepared from DNA extracted from *M. tuberculosis* strain H37Rv (control sample). Each array was scanned, using an Affymetrix 428 scanner, at two different wavelengths corresponding to the excitation maxima of each dye and the intensity of the emitted light was recorded. The raw data was processed by lmaGene software before performing comparative analysis using GeneSpring.

Results

15 Analysis of viable count data indicated that the culture grew exponentially until 10 to 12 days post infection (Fig. 4). As the culture entered stationary phase, viability started to decline and continued to decline steadily over the duration of the study. After 40 days in stationary phase, approximately 0.1 % of the culture was still culturable on Middlebrook agar. The rate of glycerol utilisation was slower than observed in the culture established under aerobic conditions, indicating that the metabolic activity of the low-oxygen culture was restricted by limited oxygen availability. Nevertheless, the principal carbon and energy source was depleted within 15 days after inoculation (Fig. 2).

25 Samples were collected for microarray analysis as outlined. The gene expression profiles for samples collected at day 5 and 50 were compared. Three arrays were prepared for each sample and the test data was normalised against the control data on each chip. The normalised data for each set of arrays was then averaged and the two data sets were compared. Those genes that were expressed at least 1.5-fold, preferably at least 5-fold higher at day 50 relative to day 5 were selected. The gene list was then added to those genes identified under "nutrient-starving" conditions, and the complete set listed in Table 2.

35 Liquid medium formulation for persistence cultures - Middlebrook 7H9 medium supplemented with ADC, 0.2 % Tween 80 and 0.2 % Glycerol

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Composition per litre:

	Na ₂ HPO ₄	2.5 g
	KH ₂ PO ₄	1.0 g
5	Monosodium glutamate	0.5 g
	(NH ₄) ₂ SO ₄	0.5 g
	Sodium citrate	0.1 g
	MgSO ₄ .7H ₂ O	0.05 g
	Ferric ammonium citrate	0.04 g
10	CuSO ₄ .5H ₂ O	1.0 mg
	Pyridoxine	1.0 mg
	ZnSO ₄ .7H ₂ O	1.0 mg
	Biotin	0.5 mg
	CaCl ₂ .2H ₂ O	0.5 mg
15	Middlebrook ADC enrichment	100 ml
	Glycerol	2.0 ml
	Tween 80	2.0 ml
20	Middlebrook ADC enrichment - per 100 ml	
	Bovine serum albumin	5.0 g
	Glucose	2.0 g
	Catalase	3.0 mg

25

Microarray protocols1. RNA extraction from *M. tuberculosis* for microarray analysis

30 Materials and Methods

* Trizol (Life Technologies) - formulation of phenol and guanidine thiocyanate.
 * GTC lysis solution containing: 5 M guanidine thiocyanate, 0.5 % N-lauryl sarcosine, 25 mM tri-sodium citrate, 0.1 M 2-mercaptoethanol, and 0.5 % Tween 80.

35

* Chloroform
 * Isopropanol
 * 3 M sodium acetate

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- * 70 % Ethanol
- * microfuge
- * ribolyser
- * Sterile plasticware-Falcon tubes, screw capped eppendorfs, gilson tips -all
- 5 RNase free
- * Glassware - baked at 160 °C for at least 16 hours

Method

- * Steps performed at Containment level 3; within a Class III microbiological safety
- 10 cabinet.
- * Remove 10 or 20 ml of culture (10^9 /ml) and immediately add this to 4 volumes of GTC lysis buffer in a plastic specimen pot. Seal the pot tightly.
- * Incubate the cells in GTC lysis buffer for 1 hour at room temperature. Surface
- 15 decontaminate the plastic pot with 5 % Hycolin for 5 minutes. Transfer the sample to the pass box and place it into a plastic carry tin with a sealable lid. Close the container securely and transport it to a non-toxic cabinet CL3 cabinet.
- * Equally distribute the lysis mixture between Falcon tubes. Place these tubes into
- 20 centrifuge buckets and seal the buckets tightly. Surface-decontaminate the buckets for 5 minutes with 5 % Hycolin. Then transfer them to the centrifuge (Baird and Tatlock Mark IV refrigerated bench-top centrifuge). Spin the tubes at 3,000 rpm for 30 minutes.
- * Return the unopened buckets to the cabinet. Remove the centrifuge tubes and pour the supernatant into a waste bottle for GTC lysis buffer.
- * Resuspend each pellet in 5 ml of Trizol (formulation of phenol and GTC cat No.
- 25 15596-026). The manufacturers guidelines recommend lysing cells by repetitive pipetting. Although this action alone will not lyse M. tuberculosis, it is important to completely resuspend the pellet in Trizol.
- * Transfer 1 ml of cells into each FastRNA tube and ribolyse them at power setting 6.5 for 45 seconds.
- 30 * Leave the tubes to incubate at room temperature for 5 minutes.
- * Remove the aqueous layer from each tube and add this to 200 µl of chloroform in a screw-capped eppendorf tube. Shake each tube vigorously for about 15 seconds. Incubate for 2-3 minutes at room temperature.
- * Spin the tubes at 13,000 rpm for 15 minutes. Following centrifugation, the
- 35 liquid separates into red phenol/chloroform phase, an interface, and a clear aqueous phase.
- * Carefully remove the aqueous phase and transfer it to fresh eppendorf tubes

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containing 500 µl of chloroform/isoamyl alcohol (24:1). Spin the tubes at 13,000 rpm for 15 minutes.

* Transfer the aqueous phase to eppendorf tubes containing 50 µl of sodium acetate and 500 µl of isopropanol.

- 5 * Surface decontaminate the eppendorf tubes with 5% Hycolin for 5 minutes. Remove the tubes from the CL3 laboratory and continue with the procedure in laboratory 157.

* Steps performed at Containment level 2:

* Precipitate the RNA at -70 °C for at least 30 minutes (optionally overnight).

- 10 * Spin the precipitated RNA down at 13,000 rpm for 10 minutes. Remove the supernatant and wash the pellet in 70 % ethanol. Repeat centrifugation.

* Remove the 70 % ethanol and air-dry the pellet. Dissolve the pellet in RNase free water.

* Freeze the RNA at -70 °C to store it.

15

2. Isolation of genomic DNA from *Mycobacterium tuberculosis* grown in chemostat culture. DNA then used to generate Cy3 or Cy5 labelled DNA for use as a control in microarray experiments

20 Materials and Methods

Beads 0.5 mm in diameter

Bead beater

Bench top centrifuge

Platform rocker

25 Heat block

Falcon 50 ml centrifuge tubes

Sorvall RC-5C centrifuge

250 ml polypropylene centrifuge pots.

Screw capped eppendorf tubes

30 Pipettes 1 ml, 200 µl, 10 ml, 5 ml

Breaking buffer

50 mM Tris HCL pH 8.0

10 mM EDTA

35 100 mM NaCl

Procedure

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Mechanical disruption of Mtb cells

- * 150 ml of chemostat cells (O.D of 2.5 at 540 nm) are spun down at 15,000 rpm for 15 minutes in 250 ml polypropylene pots using centrifuge Sorvall RC-5C.
- 5 * The supernatant is discarded.
- * Cells are re-suspended in 5 ml of breaking buffer in a 50 ml Falcon tube and centrifuged at 15,000 rpm for a further 15 minutes.
- * The supernatant is removed and additional breaking buffer is added at a volume of 5 ml. Beads are used to disrupt the cells. These are used at a quantity of 1ml
- 10 of beads for 1 ml of cells. Place the sample into the appropriate sized chamber. Place in the bead beater and secure the outer unit (containing ice) and process at the desired speed for 30 seconds.
- * Allow the beads to settle for 10 minutes and transfer cell lysate to a 50 ml Falcon centrifuge tube
- 15 * Wash beads with 2-5 ml of breaking buffer by pipetting washing buffer up and down over the beads.
- * Add this washing solution to the lysate in the falcon tube

Removal of proteins and cellular components.

- 20 * Add 0.1volumes of 10 % SDS and 0.01 volumes proteinase K.
- * Mix by inversion and heat at 55 °C in a heat block for 2-3 hours
- * The resulting mix should be homogenous and viscous. If it isn't then add more SDS to bring the concentration up to 0.2 %
- 25 * Add an equal volume of phenol/chloroform/Isoamyl alcohol in the ratio: 25/24/1.
- * Gently mix on a platform rocker until homogenous
- * Spin down at 3,000 rpm for 20 minutes
- * Remove the aqueous phase and place in a fresh tube
- * Extract the aqueous phase with an equal volume of chloroform to remove
- 30 traces of cell debris and phenol. Chloroform extractions may need to be repeated to remove all the debris.
- * Precipitate the DNA with 0.3 M sodium acetate and an equal volume of isopropanol.
- * Spool as much DNA as you can with a glass rod
- 35 * Wash the spooled DNA in 70 % ethanol followed by 100 % ethanol
- * Leave to air dry
- * Dissolve the DNA in sterile deionised water (500 µl)

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- * Allow DNA to dissolve at 4 °C for approximately 16 hours.
- * Add RNase 1 (500U) to the dissolved DNA
- * Incubate for 1 hour at 37 °C.
- * Re-extract with an equal volume of phenol/chloroform followed by a chloroform
- 5 extraction and precipitate as before
- * Spin down the DNA at 13,000 rpm
- * Remove the supernatant and wash the pellet in 70 % ethanol
- * Air dry
- * Dissolve in 200-500 µl of sterile water.

10

3. Preparation of Cy3 or Cy5 labelled DNA from DNA

a) Prepare one Cy3 or one Cy5 labelled DNA sample per microarray slide.

Each sample: DNA 2-5 µg

15 Random primers (3 µg/µl) 1 µl

H₂O to 41.5 µl

Heat at 95 °C for 5min, snap cool on ice and briefly centrifuge.

Add to each: 10*REact 2 buffer 5 µl

dNTPs (5mM dA/G/TTP, 2mM dCTP)..... 1 µl

20 Cy3 OR Cy5 dCTP..... 1.5 µl

Klenow (5U/µl) 1 µl

Incubate at 37 °C in dark for 90 min.

b) Prehybridise slide

25 Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the labelling reaction to equilibrate.

Prehybridisation: 20*SSC..... 8.75 ml (3.5*SSC)

20% SDS 250 µl (0.1 % SDS)

BSA (100 mg/ml)..... 5 ml (10 mg/ml)

30 H₂O to 50 ml

Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in 400 ml propan-2-ol for 1 min and centrifuge slide in 50 ml centrifuge tube at

35 1,500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation (<1h).

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c) Purify Cy3/Cy5 labelled DNA - Qiagen MinElute Purification

- * Combine Cy3 and Cy5 labelled DNA samples in single tube and add 500 µl Buffer PB.
- * Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 500 µl Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 250 µl Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.
- * Place the MinElute column into a fresh 1.5 ml tube.
- * Add 10.5 µl H₂O to the centre of the membrane and allow to stand for 1 min.
- * Centrifuge at 13,000 rpm for 1 min.

4. Preparation of Cy3 or Cy5 label cDNA from RNA

- a) Prepare one Cy3 and one Cy5 labelled cDNA sample per microarray slide.
- Each sample: RNA 2-10 µg
 Random primers (3 µg/µl) 1 µl
 H₂O to 11 µl
 Heat at 95 °C for 5 min, snap cool on ice and briefly centrifuge.
 Add to each: 5*First Strand Buffer 5 µl
- DTT (100 mM)..... 2.5 µl
 dNTPs (5 mM dA/G/TTP, 2 mM dCTP).... 2.3 µl
 Cy3 OR Cy5 dCTP..... 1.7 µl
 SuperScript II (200 U/µl)..... 2.5 µl
 Incubate at 25 °C in dark for 10 min followed by 42 °C in dark for 90 min.
- b) Prehybridise slide
- Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the labelling reaction to equilibrate.
- Prehybridisation:
- 20*SSC..... 8.75 ml (3.5*SSC)
 20 % SDS 250 µl (0.1% SDS)

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BSA (100 mg/ml)..... 5 ml (10 mg/ml)

H₂O to 50 ml

Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in 400 ml propan-2-ol for 1 min and centrifuge slide in 50 ml centrifuge tube at 1500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation (<1h).

10 c) Purify Cy3/Cy5 labelled cDNA - Qiagen MinElute Purification

* Combine Cy3 and Cy5 labelled DNA samples in single tube and add 250 µl Buffer PB.

* Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.

15 * Discard flow-through and place MinElute column back into same collection tube.

* Add 500 µl Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.

* Discard flow-through and place MinElute column back into same collection tube.

* Add 250 µl Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1min.

* Discard flow-through and place MinElute column back into same collection tube.

* Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.

* Place the MinElute column into a fresh 1.5 ml tube.

* Add 10.5 μ l H₂O to the centre of the membrane and allow to stand for 1 min.

25 * Centrifuge at 13,000 rpm for 1 min.

5. Hybridise slide with Cy3/Cy5 labelled cDNA/DNA

Place the prehybridised microarray slide in the hybridisation cassette and add two 15 µl aliquots of H₂O to the wells in the cassette. Mix resuspended Cy3/Cy5 labelled cDNA sample with hybridisation solution.

Hybridisation: Cy3/Cy5 labelled cDNA sample.....10.5 µl

20xSSC3.2 µl (4xSSC)

35 2% SDS.....2.3 µl (0.3% SDS)

Heat hybridisation solution at 95 °C for 2 min. Do NOT snap cool on ice but allow

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- to cool slightly and briefly centrifuge. Pipette the hybridisation solution onto the slide at the edge of the arrayed area avoiding bubble formation. Using forceps carefully drag the edge of a cover slip along the surface of the slide towards the arrayed area and into the hybridisation solution at the edge of the array. Carefully lower the cover slip down over the array avoiding any additional movement once in place. Seal the hybridisation cassette and submerge in a water bath at 65 °C for 16-20 hours.

Wash slide

10

Remove microarray slide from hybridisation cassette and initially wash slide carefully in staining trough of Wash A preheated to 65 °C to remove cover slip. Once cover slip is displaced place slide(s) in slide rack and continue agitating in Wash A for a further 2 min.

15

Wash A: 20xSSC.....20 ml (1xSSC)
 20% SDS.....1 ml (0.05% SDS)
 H₂O.....to 400 ml

20

Transfer slide(s) to a clean slide rack and agitate in first trough of Wash B for 2 min. Wash in second trough of Wash B with agitation for 2 min.

Wash B (x2): 20xSSC.....1.2 ml (0.06xSSC)
 H₂O.....to 400 ml

25

Place slide into a 50 ml centrifuge tube and centrifuge at 1500 rpm for 5 mins to dry slide and then scan fluorescence.

Table 2.

Genes induced or up-regulated under nutrient-starving conditions, or under nutrient-starving and oxygen-limiting conditions.

Gene	Assigned function	SEQ. ID. NO.
5 Rv0021c	2-nitropropane dioxygenase	1, 2
Rv0029		3, 4
Rv0076c	peptide with a membrane-spanning domain at its C-terminus	5, 6
Rv0111	acetyltransferase	7, 8
Rv0161	oxidoreductase	9, 10
10 Rv0212c	transcriptional regulator	11, 12
Rv0228	acyl transferase	13, 14
Rv0260c	two-component response regulator	15, 16
Rv0311		17, 18
Rv0322	UDP-glucose dehydrogenase	19, 20
15 Rv0325		21, 22
Rv0389	phosphoribosylglycinamide formyltransferase	23, 24
Rv0390		25, 26
Rv0395		27, 28
Rv0480c		29, 30
20 Rv493c		31, 32
Rv0534c	1,4-dihydroxy-2-naphthoate octaprenyl	33, 34
Rv0557		35, 36
Rv0614		37, 38
Rv0621	peptide containing a membrane-spanning region	39, 40
25 Rv0622	peptide containing a membrane-spanning region	41, 42
Rv0697	gmc-type oxidoreductase	43, 44
Rv0698		45, 46
Rv0736		47, 48
Rv0751c	3-hydroxyisobutyrate dehydrogenase; methylmalonate semialdehyde dehydrogenase	49, 50
30 Rv0775		51, 52

Gene	Assigned function	SEQ. ID. NO.
Rv0776c		53, 54
Rv0785	dehydrogenase	55, 56
Rv0790c		57, 58
Rv0794c	mercuric reductase; glutathione reductase; dihydrolipoamide dehydrogenase	59, 60
5Rv0795	transposase	61, 62
Rv0836c		63, 64
Rv0837c		65, 66
Rv0840c	proline iminopeptidase; prolyl aminopeptidase	67, 68
Rv0849	integral membrane transport protein; quinolone efflux pump	69, 70
10Rv0917	glycine betaine transporter	71, 72
Rv978c		73, 74
Rv1051c		75, 76
Rv1056		77, 78
Rv1089		79, 80
15Rv1146	membrane protein	81, 82
Rv1147	phosphatidylethanolamine N-methyltransferase	83, 84
Rv1370c	transposase	85, 86
Rv1371	membrane protein	87, 88
Rv1372	chalcone synthase 2	89, 90
20Rv1373	sulfotransferase	91, 92
Rv1429		93, 94
Rv1455		95, 96
Rv1482c		97, 98
Rv1496		99, 100
25Rv1526c	glycosyl transferase	101, 102
Rv1528c	PKS-associated protein	103, 104
Rv1552	fumarate reductase flavoprotein	105, 106
Rv1569	8-amino-7-oxononanoate synthase; aminotransferase class-II pyridoxal-phosphate	107, 108

Gene	Assigned function	SEQ. ID. NO.
Rv1573	phage phiRv1 protein	109, 110
Rv1577c	bacteriophage HK97 prohead protease; phage phiRv1 protein	111, 112
Rv1670		113, 114
Rv1725c		115, 116
5Rv1730	penicillin-binding protein	117, 118
Rv1763	transposase	119, 120
Rv1765c		121, 122
Rv1777	cytochrome p450	123, 124
Rv1806		125, 126
10Rv1866	fatty acyl-CoA racemase	127, 128
Rv1917c		129, 130
Rv1939	nitroacetate monooxygenase	131, 132
Rv2013	transposase	133, 134
Rv2027c	histidine kinase response regulator	135, 136
15Rv2086	transposase	137, 138
Rv2087	transposase	139, 140
Rv2089c	pepQ; peptidase	141, 142
Rv2091c	peptide containing a transmembrane region	143, 144
Rv2093c	TatC component of twin-arginine translocation protein export system	145, 146
20Rv2105	transposase	147, 148
Rv2168c	transposase	149, 150
Rv2242		151, 152
Rv2282c	LysR transcription regulator	153, 154
Rv2292c		155, 156
25Rv2310	excisionase	157, 158
Rv2322c	ornithine aminotransferase	159, 160
Rv2323c		161, 162
Rv2332	malate oxidoreductase	163, 164
Rv2400c	thiosulphate-binding protein	165, 166
30Rv2414c		167, 168
Rv2437		169, 170

Gene	Assigned function	SEQ. ID. NO.
Rv2478c		171, 172
Rv2486	enoyl-coA hydratase	173, 174
Rv2505c	acyl-CoA synthetase	175, 176
Rv2529	methyltransferase	177, 178
5 Rv2596		179, 180
Rv2847c	multifunctional enzyme; siroheme synthase	181, 182
Rv3635	transmembrane protein	183, 184
Rv2643	membrane protein	185, 186
Rv2648	transposase	187, 188
10 Rv2655c		189, 190
Rv2684	transmembrane protein; arsenical pump	191, 192
Rv2687c	regulatory protein	193, 194
Rv2690c	transport protein; permease	195, 196
Rv2800	glutaryl 7-aca acylase	197, 198
15 Rv2812	transposase	199, 200
Rv2813	secretion pathway protein	201, 202
Rv2835c	sn-glycerol-3-phosphate transport system permease protein	203, 204
Rv2874	integral membrane protein	205, 206
Rv2877c	mercury resistance protein	207, 208
20 Rv2943	transposase	209, 210
Rv2998		211, 212
Rv3015c		213, 214
Rv3022c		215, 216
Rv3039c	enoyl-CoA hydratase/isomerase	217, 218
25 Rv3061c	acyl-CoA dehydrogenase	219, 220
Rv3064c		221, 222

Gene	Assigned function	SEQ. ID. NO.
Rv3097c	esterase; lipase	223, 224
Rv3107c	dehydrogenase	225, 226
Rv3162c		227, 228
Rv3178		229, 230
5Rv3184	transposase	231, 232
Rv3315c	cytidine deaminase	233, 234
Rv3322c	methyltransferase	235, 236
Rv3351c		237, 238
Rv3352c	oxidoreductase	239, 240
10Rv3373	enoyl-CoA hydratase (crotonase)	241, 242
Rv3439c		243, 244
Rv3446c		245, 246
Rv3447c	membrane protein	247, 248
Rv3450c		249, 250
15Rv3467		251, 252
Rv3505	acyl-CoA dehydrogenase	253, 254
Rv3540c	lipid-transfer protein	255, 256
Rv3546	acetyl-CoA C-acetyltransferase	257, 258
Rv3550	enoyl-CoA hydratase/isomerase	259, 260
20Rv3552		261, 262
Rv3565	aminotransferase	263, 264
Rv3569c	hydrolase	265, 266
Rv3606c	2- amino-4-hydroxy-6-hydroxymethylidihydropterine pyrophosphokinase	267, 268
Rv3637	transposase	269, 270
25Rv3660c		271, 272
Rv3745c		273, 274
Rv3903c		275, 276
Rv0039c		277, 278
Rv0903c		279, 280
30Rv2745c		281, 282

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References:

1. McKinney, J.D., et al., Persistence of *Mycobacterium tuberculosis* in macrophages and mice requires the glyoxylate shunt enzyme isocitrate lyase [see
5 comments]. *Nature*, 2000. 406(6797): p. 735-8.
2. Pelicic, V., et al., Efficient allelic exchange and transposon mutagenesis in *Mycobacterium tuberculosis*. *Proc Natl Acad Sci U S A*, 1997. 94(20): p. 10955-60.
10
3. Lee, M.H., et al., Site-specific integration of mycobacteriophage L5: integration- proficient vectors for *Mycobacterium smegmatis*, *Mycobacterium tuberculosis*, and bacille Calmette-Guerin. *Proc Natl Acad Sci U S A*, 1991. 88(8): p. 3111-5.
15
4. McShane, H., et al., Enhanced immunogenicity of CD4(+) t-cell responses and protective efficacy of a DNA-modified vaccinia virus Ankara prime-boost vaccination regimen for murine tuberculosis. *Infect Immun*, 2001. 69(2): p. 681-6.
- 20 5. Movahedzadeh, F., M.J. Colston, and E.O. Davis, Characterization of *Mycobacterium tuberculosis* LexA: recognition of a Cheo (Bacillus-type SOS) box. *Microbiology*, 1997. 143(Pt 3): p. 929-36.

Additional References:

- 25 Cunningham, A. F. and C. L. Spreadbury. 1998. Mycobacterial stationary phase induced by low oxygen tension: cell wall thickening and localization of the 16-kilodalton alpha-crystallin homolog. *J. Bacteriol.* 180:801-808.
- 30 Lalvani, A. *et al.*, 2001. Enhanced contact tracing and spatial tracking of *Mycobacterium tuberculosis* infection by enumeration of antigen-specific T cells. *The Lancet* 357:2017-2021.

-77-

Rook, G. A. W. and B. R. Bloom. 1994. Mechanisms of pathogenesis in tuberculosis, pp 460-485. In B. R. Bloom (ed), Tuberculosis- pathogenesis, protection and control. ASM Press, Washington DC.

- 5 Wayne, L. G. 1994. Dormancy of *Mycobacterium tuberculosis* and latency of disease. Eur. J. Clin. Microbiol. Infect. Dis. 13:908-914.

Wayne, L. G. and L. G. Hayes. 1996. An in vitro model for sequential study of shift-down of *Mycobacterium tuberculosis* through two stages of non-replicating
10 persistence. Infect. Immun. 64:2062-2069.

Wayne, L. G. and K. Lin. 1982. Glyoxylate metabolism and adaptation of *Mycobacterium tuberculosis* to survival under anaerobic conditions. Infect. Immun. 37:1042-1049.

15

Sambrook, J., E. F. Fritsch, and T. Maniatis. 1989. Molecular cloning: a laboratory manual, 2nd ed. Cold Spring Harbour Laboratory Press, Cold Spring Harbour, N. Y.

- 20 Lefever, P., O. Denis, L. De Wit, A. Tanghe, P. Vandenbussche, J. Content, and K. Huygen. 2000. Cloning of the gene encoding a 22-kilodalton cell surface antigen of *Mycobacterium bovis* BCG and analysis of its potential for DNA vaccination against tuberculosis. Infection and Immunity. 68:1040-1047.

- 25 Vordermeire, H. M., P. J. Cockle, A. O. Whelan, S. Rhodes, M. A. Chambers, D. Clifford, K. Huygen, R. Tascon, D. Lowrie, M. J. Colston, and R. G. Hewinson. 2000. Effective DNA vaccination of cattle with the mycobacterial antigens MPB83 and MPB70 does not compromise the specificity of the comparative intradermal tuberculin skin test. Vaccine. 19:1246-1255.

- 30 Cheng, W., C. Hung, C. Chai, K. Hsu, L. He, C. Rice, M. Ling, and T. Wu. 2001. Enhancement of Sindbis virus self-replicating RNA vaccine potency by linkage of *Mycobacterium tuberculosis* heat shock protein 70 gene to an antigen. J. Immunol. 166:6218-6226.

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Claims

1. An isolated mycobacterial peptide, or a fragment or derivative or variant of said peptide, wherein the peptide is encoded by a mycobacterial gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

2. An isolated mycobacterial peptide according to Claim 1, or a fragment or variant or derivative thereof, wherein the peptide is selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, and 281.

3. A method of identifying a mycobacterial gene the expression of which is induced or up-regulated during mycobacterial latency, said method comprising:-

culturing a first mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation;

culturing a second mycobacterium under culture conditions that are not nutrient-starving and which support exponential growth of the second mycobacterium;

obtaining first and second mRNA populations from said first and second mycobacteria, respectively wherein said first mRNA population is obtained from the

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first mycobacterium which has been cultured under nutrient-starving conditions obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation, and wherein said second mRNA is obtained from the second mycobacterium which has been cultured under conditions that are not nutrient-starving and which support exponential growth of said second mycobacterium;

5 preparing first and second cDNA populations from said first and second mRNA populations, respectively, during which cDNA preparation a detectable label is introduced into the cDNA molecules of the first and second cDNA populations;

10 isolating corresponding first and second cDNA molecules from the first and second cDNA populations, respectively;

comparing relative amounts of label or corresponding signal emitted from the label present in the isolated first and second cDNA molecules;

identifying a greater amount of label or signal provided by the isolated first cDNA molecule than that provided by the isolated second cDNA molecule; and

15 identifying the first cDNA and the corresponding mycobacterial gene that is induced or up-regulated during culture of a mycobacterium under latency conditions.

4. A method according to Claim 3, wherein the corresponding first and second cDNA molecules are isolated from the first and second cDNA populations, respectively, by hybridisation thereof to an array plate containing immobilised amplified DNA sequences that have been generated from mycobacterial genomic DNA, said immobilised sequences being representative of each known gene of the mycobacterial genome, and each representative sequence having been immobilised
25 at an identified location on the plate.

5. A method according to Claim 3 or Claim 4, wherein the first mycobacterium is harvested at least 30, preferably at least 40 days post-inoculation.

30 6. A method according to any of Claims 3-5, wherein the culture conditions are carbon-starving to the growth of the mycobacteria.

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7. A method according to any of Claims 3-6, wherein the first mycobacterium is cultured under culture conditions defined by a dissolved oxygen tension of less than 10 %, preferably less than 7%, more preferably less than 5 %, air saturation when measured at 37 °C, and wherein the first mycobacterium is harvested under said culture conditions.

8. A method according to any of Claims 3-7, wherein a relative induction or up-regulation is identified by a relative 3-fold, preferably a relative 4-fold increase in the amount of label or signal provided by the isolated first cDNA molecule over that provided by the isolated second cDNA molecule.

9. An inhibitor of a mycobacterial peptide, wherein the peptide is encoded by a mycobacterial gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium, wherein the inhibitor is capable of preventing or inhibiting the mycobacterial peptide from exerting its native biological effect.

10. An inhibitor according to Claim 9, wherein the inhibitor is capable of inhibiting a protein selected from the group consisting of:- 2-nitropropane dioxygenase, acetyltransferase, oxidoreductase, transcriptional regulator, acyl transferase, UDP-glucose dehydrogenase, phosphoribosylglycinamide formyltransferase, 1,4-dihydroxy-2-naphthoate octaprenyl, gmc-type oxidoreductase, 3-hydroxyisobutyrate dehydrogenase, methylmalonate semialdehyde dehydrogenase, dehydrogenase, mercuric reductase, glutathione reductase, dihydrolipoamide, transposase, proline iminopeptidase, prolyl aminopeptidase, quinolone efflux pump, glycine betaine transporter, phosphatidylethanolamine N-methyltransferase, chalcone synthase 2, sulfotransferase, glycosyl transferase, fumarate reductase flavoprotein, 8-amino-7-oxononanoate synthase, aminotransferase class-II pyridoxal-phosphate, bacteriophage HK97 prohead protease, penicillin-binding protein, fatty acyl-CoA racemase, nitrilotriacetate monooxygenase, histidine kinase response regulator,

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peptidase, LysR transcription regulator, excisionase, ornithine aminotransferase, malate oxidoreductase, thiosulphate binding protein, enoyl-CoA hydratase, acyl-CoA synthetase, methyltransferase, siroheme synthase, permease, glutaryl 7-acylase, sn-glycerol-3-phosphate transport system permease, enoyl-CoA
 5 hydratase/isomerase, acyl-CoA dehydrogenase, esterase, lipase, cytidine deaminase, crotonase, lipid-transfer protein, acetyl-CoA C-acetyltransferase, aminotransferase, hydrolase, and 2-amino-4-hydroxy-6-hydroxymethyldihydropterine pyrophosphokinase.

10 11. An inhibitor according to Claim 9 or Claim 10, selected from the group consisting of:- an antibiotic capable of targeting the induced or up-regulated mycobacterial gene, or the gene product thereof; and an antisense or triplex-forming nucleic acid sequence which is complementary to at least part of the inducible or up-regulatable gene.

15

12. An antibody which binds to a peptide encoded by a mycobacterial gene, or to a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch
 20 fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

13. An antibody according to Claim 12, wherein the peptide is selected from the
 25 group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165,
 30 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249; 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, and 281.

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14. An attenuated mycobacterium in which a gene has been modified thereby rendering the mycobacterium substantially non-pathogenic, wherein the gene is a gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions
5 being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

15. An attenuated mycobacterium according to Claim 14, wherein the gene to be
10 modified has a wild-type coding sequence corresponding to one of the group consisting of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136,
15 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282.

20

16. An attenuated microbial carrier, comprising a mycobacterial peptide encoded by a gene, or a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable
25 by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

17. An attenuated microbial carrier, according to Claim 16 wherein the peptide is
30 selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127,

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129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157,
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5 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277,
279, and 281.

18. An attenuated microbial carrier according to Claim 16 or 17, wherein the
attenuated microbial carrier is attenuated salmonella, attenuated vaccinia virus,
10 attenuated fowlpox virus, or attenuated *M. bovis* (eg. BCG strain).

19. A DNA plasmid comprising a promoter, a polyadenylation signal, and DNA
sequence that is the coding sequence of a mycobacterial gene or a fragment or
derivative or variant of said coding sequence, the expression of which gene is
15 induced or up-regulated under culture conditions that are nutrient-starving and
which maintain mycobacterial latency, said conditions being obtainable by batch
fermentation of a mycobacterium for at least 20 days post-inoculation, when
compared with culture conditions that are not nutrient-starving and which support
exponential growth of said mycobacterium, wherein the promoter and
20 polyadenylation signal are operably linked to the DNA sequence.

20. A DNA plasmid according to Claim 19, wherein the DNA sequence is selected
from the group consisting of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22,
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252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280,
and 282.

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21. A DNA plasmid according to Claim 19 or 20, wherein the promoter is selected from the group consisting of CMV and SV40 promoters, and/or the polyadenylation signal is selected from SV40 and bovine growth hormone polyadenylation signals.

5 22. An isolated RNA sequence that is encoded by a DNA sequence, wherein the DNA sequence is the coding sequence of a mycobacterial gene or a fragment or variant or derivative of said DNA coding sequence, which gene is induced or up-regulated during culture of a mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being
10 obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

23. An RNA vector comprising the RNA sequence of Claim 22 and an integration
15 site for a chromosome of a host cell.

24. Use of a peptide or fragment or variant or derivative according to Claim 1 or Claim 2; an inhibitor according to any of Claims 9-11; an antibody according to Claim 12 or 13; an attenuated mycobacterium according to Claim 14 or 15; an
20 attenuated microbial carrier according to any of Claims 16-18; a DNA sequence that is the coding sequence of a mycobacterial gene or a fragment or variant or derivative of said coding sequence, which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium
25 for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium; a DNA plasmid according to any of Claims 19-21; an RNA sequence according to Claim 22; and/or an RNA vector according to Claim 23; in the manufacture of a medicament for treating or preventing a mycobacterial
30 infection.

25. A method of treating or preventing a mycobacterial infection, by administering to a patient a peptide or fragment or variant or derivative according to Claim 1 or

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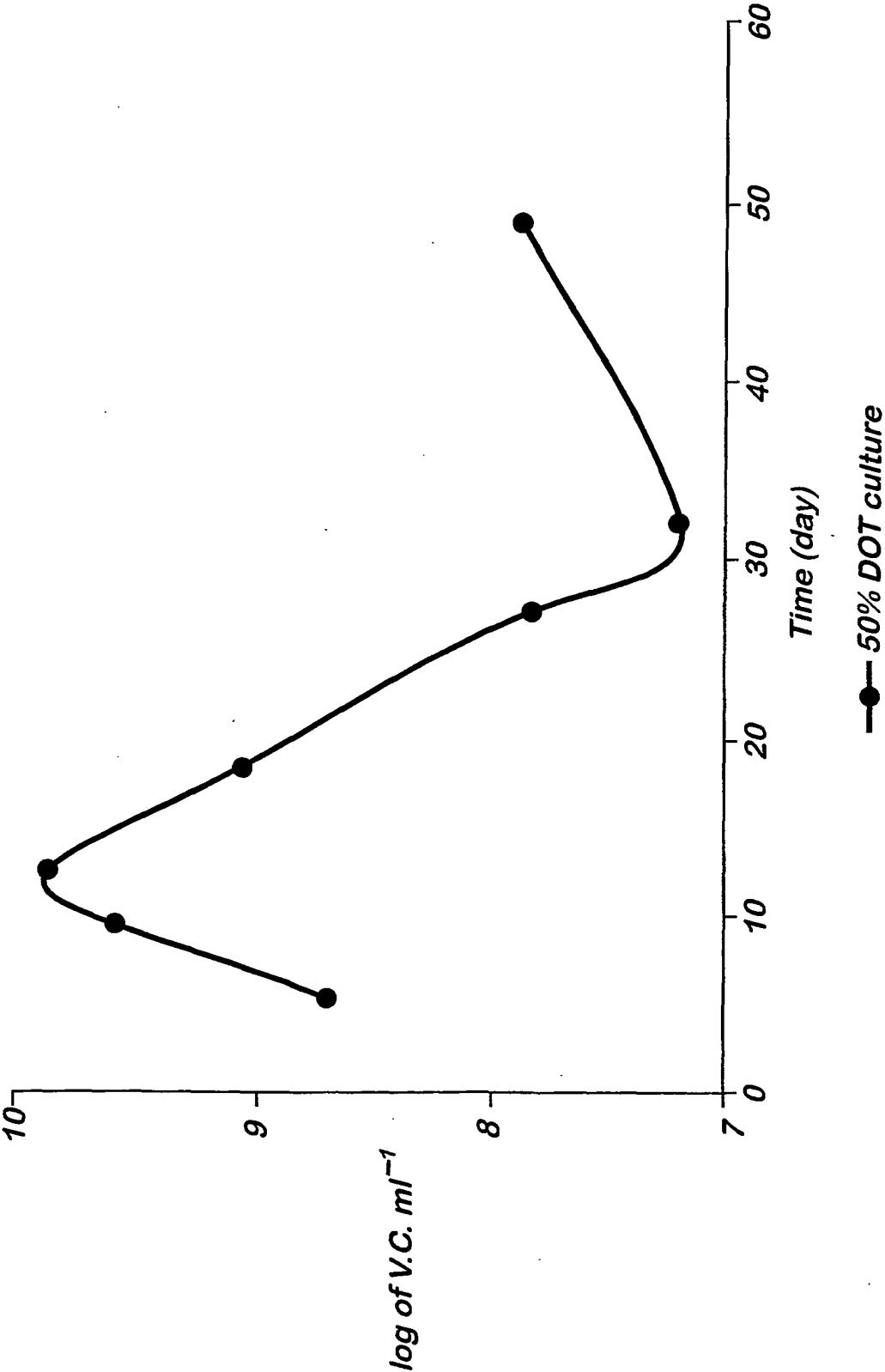
Claim 2; an inhibitor according to any of Claims 9-11; an antibody according to Claim 12 or 13; an attenuated mycobacterium according to Claim 14 or 15; an attenuated microbial carrier according to any of Claims 16-18; a DNA sequence that is the coding sequence of a mycobacterial gene or a fragment or variant or
5 derivative of said coding sequence, which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation when compared with culture conditions that are not nutrient-starving and which support exponential growth of said
10 mycobacterium; a DNA plasmid according to any of Claims 19-21; an RNA sequence according to Claim 22; and/or an RNA vector according to Claim 23.

26. Use of a peptide or fragment or variant or derivative according to Claim 1 or 2; or an antibody according to Claim 12 or 13; or a polynucleotide probe comprising at
15 least 8 nucleotides wherein said probe binds to at least part of a mycobacterial gene which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation when compared with culture conditions that are not nutrient-starving and which
20 support exponential growth of said mycobacterium; in the manufacture of a diagnostic reagent for identifying a mycobacterial infection.

27. An isolated peptide, an inhibitor, an antibody, an attenuated mycobacterium, an attenuated microbial carrier, an isolated RNA molecule, an RNA vector, or a DNA
25 plasmid substantially as hereinbefore described with reference to the Examples.

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Fig. 1



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Fig. 2

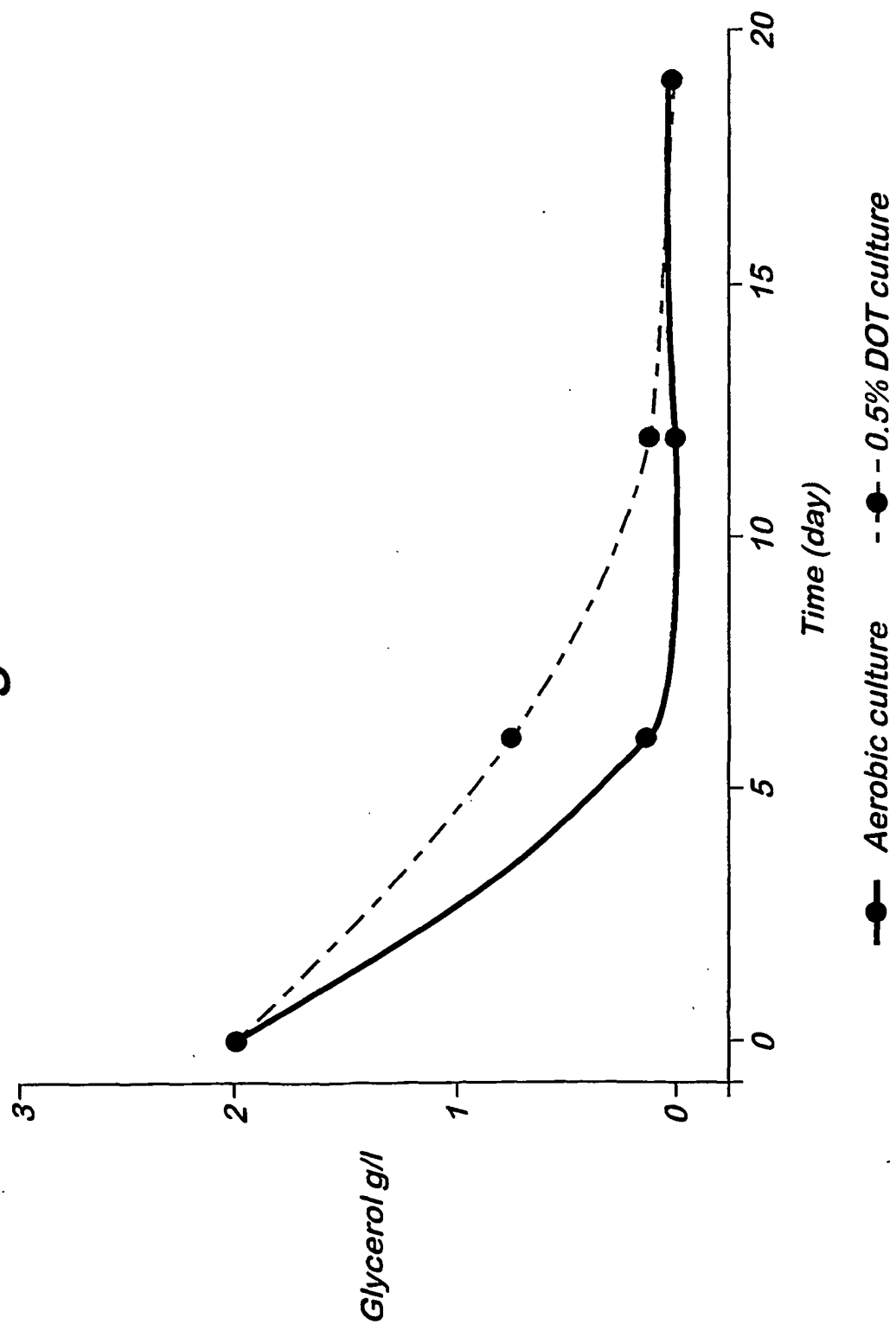
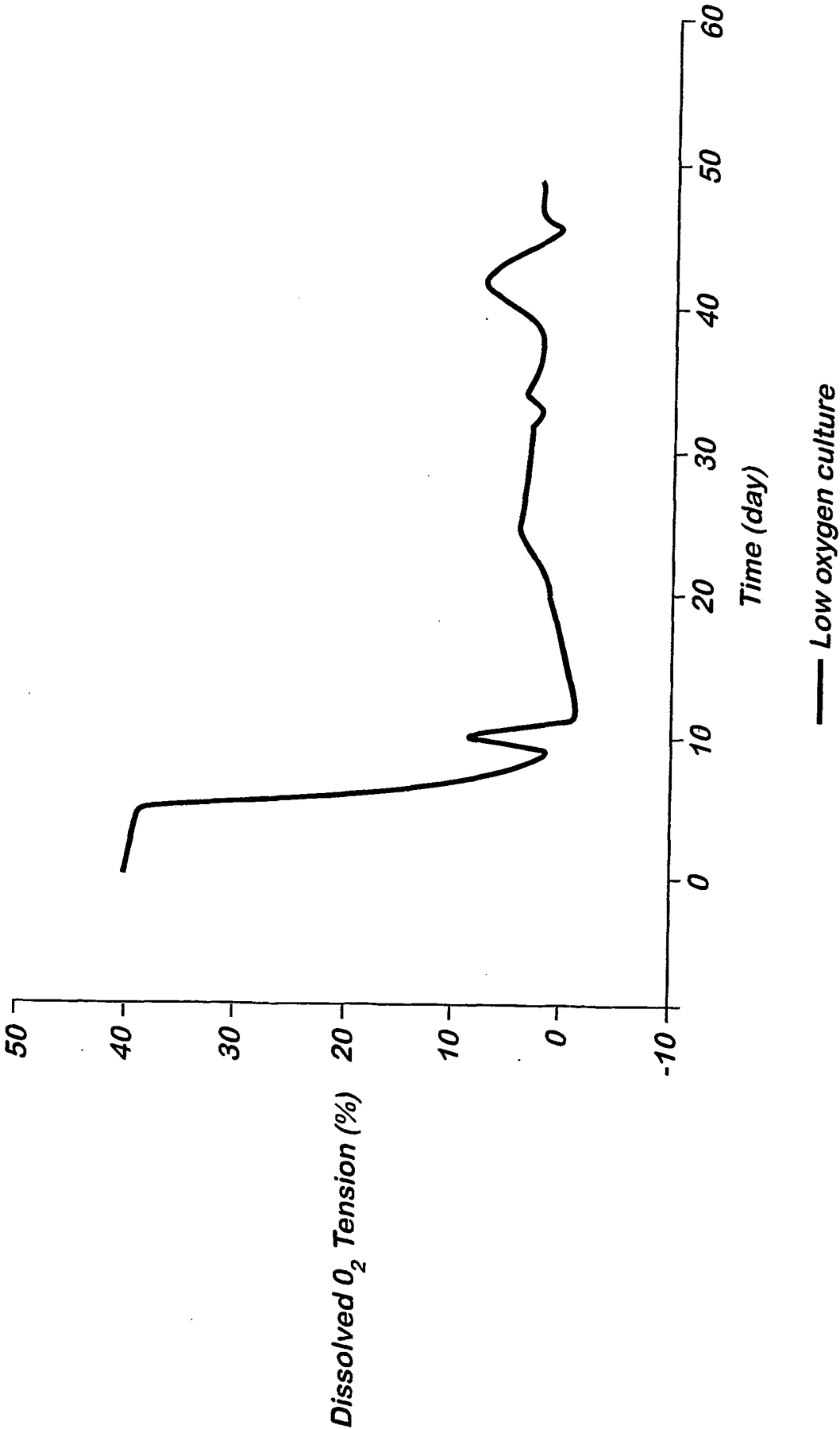
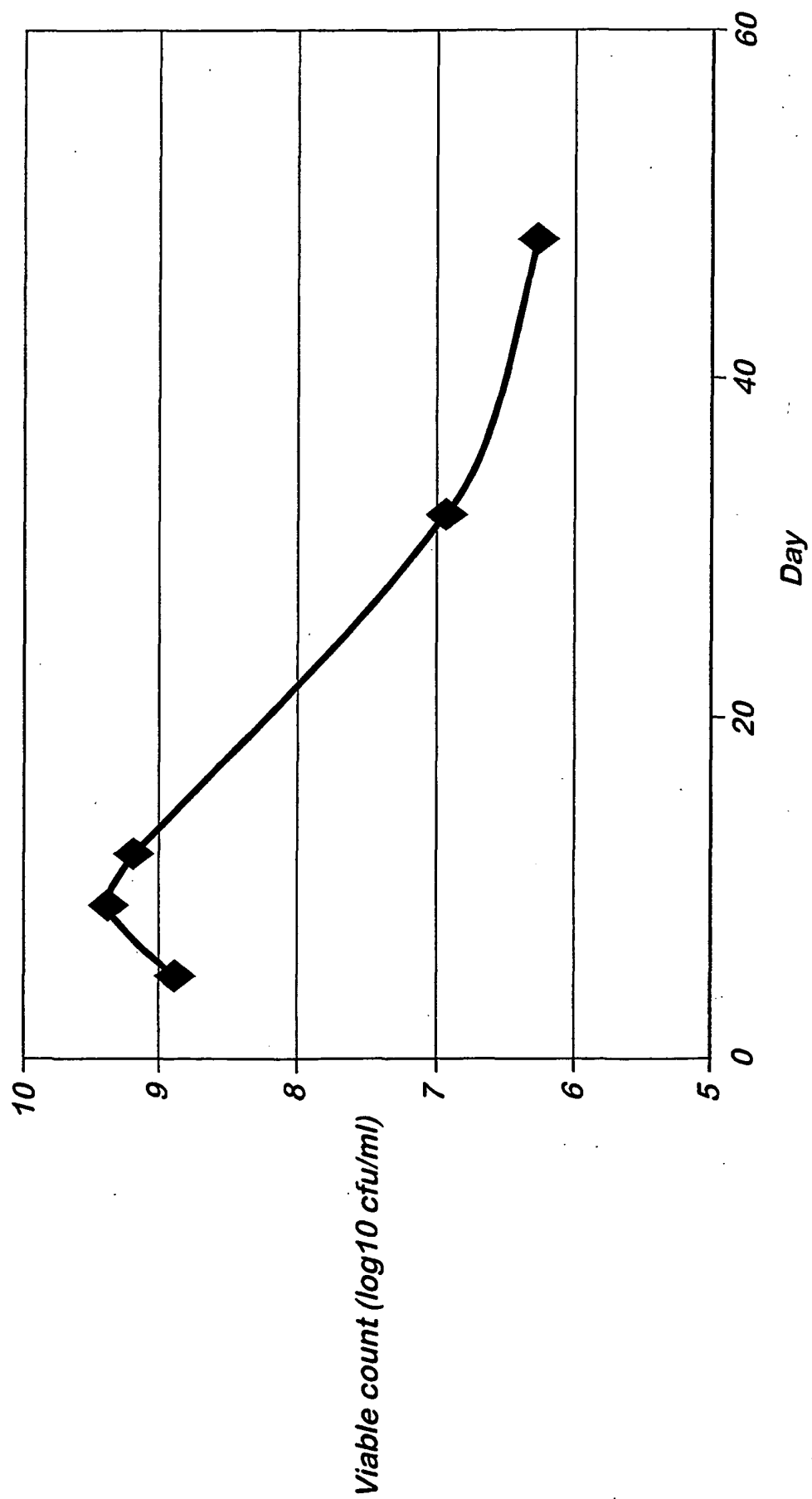


Fig. 3



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Fig. 4



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Marsh, Philip

Hampshire, Toby

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Arg Gly Arg Ala Ser Ala Leu Val Arg Pro Gly Ser Ala Glu Glu Val
 35 40 45

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Ala Glu Val Leu Arg Val Cys Arg Asp Ala Gly Ala Tyr Val Thr Val
 50 55 60

Gln Gly Gly Arg Thr Ser Leu Val Ala Gly Thr Val Pro Glu His Asp
 65 70 75 80

Asp Val Leu Leu Ser Thr Glu Arg Leu Cys Val Val Ser Asp Val Asp
 85 90 95

Thr Val Glu Arg Arg Ile Glu Ile Gly Ala Gly Val Thr Leu Ala Ala
 100 105 110

Val Gln His Ala Ala Ser Thr Ala Gly Leu Val Phe Gly Val Asp Leu
 115 120 125

Ser Ala Arg Asp Thr Ala Thr Val Gly Gly Met Ala Ser Thr Asn Ala
 130 135 140

Gly Gly Leu Arg Thr Val Arg Tyr Gly Asn Met Gly Glu Gln Val Val
 145 150 155 160

Gly Leu Asp Val Ala Leu Pro Asp Gly Thr Val Leu Arg Arg His Ser
 165 170 175

Arg Val Arg Arg Asp Asn Thr Gly Tyr Asp Leu Pro Ala Leu Phe Val
 180 185 190

Gly Ala Glu Gly Thr Leu Gly Val Ile Thr Ala Leu Asp Leu Arg Leu
 195 200 205

His Pro Thr Pro Ser His Arg Val Thr Ala Val Cys Gly Phe Ala Glu
 210 215 220

Leu Ala Ala Leu Val Asp Ala Gly Arg Met Phe Arg Asp Val Glu Gly
 225 230 235 240

Ile Ala Ala Leu Glu Leu Ile Asp Gly Arg Ala Ala Ala Leu Thr Arg
 245 250 255

Glu His Leu Gly Val Arg Pro Pro Val Glu Ala Asp Trp Leu Leu Leu
 260 265 270

Val Glu Leu Ala Ala Asp His Asp Gln Thr Asp Arg Leu Ala Asp Leu
 275 280 285

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Leu Gly Gly Ala Arg Met Cys Gly Glu Pro Ala Val Gly Val Asp Ala
 290 295 300

Ala Ala Gln Gln Arg Leu Trp Arg Thr Arg Glu Ser Leu Ala Glu Val
 305 310 315 320

Leu Gly Val Tyr Gly Pro Pro Leu Lys Phe Asp Val Ser Leu Pro Leu
 325 330 335

Ser Ala Ile Ser Gly Phe Ala Arg Asp Ala Val Ala Leu Val His Arg
 340 345 350

His Val Pro Asp Ser Pro Glu Ala Leu Pro Leu Leu Phe Gly His Ile
 355 360 365

Gly Glu Gly Asn Leu His Leu Asn Val Leu Arg Cys Pro Pro Asp Arg
 370 375 380

Glu Pro Ala Leu Tyr Ala Lys Met Met Gly Leu Ile Ala Glu Cys Gly
 385 390 395 400

Gly Asn Val Ser Ser Glu His Gly Val Gly Ser Arg Lys Arg Ala Tyr
 405 410 415

Leu Gly Met Ser Arg Gln Ala Asn Asp Val Ala Ala Met Arg Arg Val
 420 425 430

Lys Ala Ala Leu Asp Pro Thr Gly Tyr Leu Asn Ala Ala Val Leu Phe
 435 440 445

Asp

<210> 10

<211> 1347

<212> DNA

<213> Mycobacterium tuberculosis

<400> 10

atgctaacca gcttggtgag tgcgggtcgga tcgcatcacg tcaccaccga ccctgacgtg

60

-15-

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ctggccggcc gcagcgtcga ccacaccggc cgctatcggg gccggggccag cgcgctggtg 120
cgccccggct cggctgaaga ggtcgccgaa gtgctgcggg tgtgccggga cgcaggagcc 180
tatgtcaccg ttcaaggcgg ccgcacctca ctgggtggcg gcaccgttcc cgaacacgac 240
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cggcaggcca acgacgtcgc cgcgatgcgg aggggtcaagg cggcggttga cccgaccggg 1320
taccttaacg ccgcggtcct gttcgac 1347

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<210> 11

<211> 323

<212> PRT

<213> Mycobacterium tuberculosis

<400> 11

Val Thr His Gly Met Val Leu Gly Lys Phe Met Pro Pro His Ala Gly

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1	5	10	15
His Val Tyr	Leu Cys Glu Phe Ala Arg Arg Trp Val Asp Glu Leu Thr		
	20	25	30
Ile Val Val Gly Ser Thr Ala Ala Glu Pro Ile Pro Gly Ala Gln Arg			
	35	40	45
Val Ala Trp Met Arg Glu Leu Phe Pro Phe Asp Arg Val Val His Leu			
	50	55	60
Ala Asn Glu Asn Pro Gln Arg Pro Trp Glu His Pro Asp Phe Trp Asp			
65	70	75	80
Ile Trp Lys Ala Ser Leu Gln Gly Val Leu Ala Thr Arg Pro Asp Phe			
	85	90	95
Val Phe Gly Ala Glu Pro Tyr Asn Ala Asp Phe Ala Gln Val Leu Gly			
	100	105	110
Ala Arg Phe Val Ala Val Asp His Gly Arg Thr Val Val Pro Val Thr			
	115	120	125
Ala Thr Asp Ile Arg Ala Asp Pro Leu Gly His Trp Gln His Ile Pro			
	130	135	140
Arg Cys Val Arg Pro Ala Phe Val Lys Arg Val Ser Ile Ile Gly Pro			
145	150	155	160
Glu Ser Thr Gly Lys Thr Thr Leu Ala Gln Ala Val Ala Glu Lys Leu			
	165	170	175
Arg Thr Lys Trp Val Pro Glu Arg Ala Lys Met Leu Arg Glu Leu Asn			
	180	185	190
Gly Gly Ser Leu Ile Gly Leu Glu Trp Ala Glu Ile Val Arg Gly Gln			
	195	200	205
Ile Ala Ser Glu Glu Ala Leu Ala Arg Asp Ala Asp Arg Val Leu Ile			
	210	215	220
Cys Asp Thr Asp Pro Leu Ala Thr Thr Val Trp Ala Glu Phe Leu Ala			
225	230	235	240

Gly Gly Cys Pro Gln Glu Leu Arg Asp Leu Ala Arg Arg Pro Tyr Asp
245 250 255

Leu Thr Leu Leu Thr Thr Pro Asp Val Pro Trp Asp Ala Asp Asp Gly
260 265 270

Arg Cys Val Pro Gly Ala Arg Gly Thr Phe Phe Ala Arg Cys Glu Gln
275 280 285

Ala Leu Arg Ala Ala Gly Arg Ser Phe Val Val Ile Thr Gly Gly Trp
290 295 300

Glu Glu Arg Leu Ser Val Ser Leu Arg Ala Val Glu Glu Leu Val Arg
305 310 315 320

Ala Arg Arg

<210> 12

<211> 969

<212> DNA

<213> Mycobacterium tuberculosis

<400>	12
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gagccgattc cgggcgcccc gcgcgttgca tggatgcggg agctgttccc cttcgatcgc	180
gtggtccatc tggccaacga gaaccgcgag cgcccgtggg agcacccgga cttctgggac	240
atctggaagg cgagcctgca gggcgtgctg gcaaccgcgc ccgaacttcgt cttcggtgcc	300
gagccctaca acgcggactt tgcccaggtc ctcgtagcgc gtttcgtggc ggtcgatcac	360
ggtcgcaccg tcgttcccgt gactgcaacc gacatccgcg cggaccgcgt tggccactgg	420
caacacatcc cacggtgcgt gcggccggcc ttcgtcaaac gcgtgagcat catcggaacc	480
gaatccaccg ggaagaccac gctggcacag gcggttcggg aaaagctccg aacgaagtgg	540
gtcccggagc gggcgaaaaat gttgcgggag ctcaatggcg gotcactgat aggactggag	600
tgggccgaaa tcgttcgcgg acagatcgcg tcggaggaag cettggctcg tgacgccgat	660
cgcctcctga tctgcgacac ggatccgcgc gcgacgaccg tgtggggcga gttcctggcg	720

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ggcgggtgcc cgcaagagct ccgtgatcta gctcggcgct cctacgatct cacactgctc 780
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 gcccgccgc 969

<210> 13

<211> 407

<212> PRT

<213> Mycobacterium tuberculosis

<400> 13

Met Gly Pro Ala Asp Glu Ser Gly Ala Pro Ile Arg Pro Gln Thr Pro
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His Arg His Thr Val Leu Val Thr Asn Gly Gln Val Val Gly Gly Thr
 20 25 30

Arg Gly Phe Leu Pro Ala Val Glu Gly Met Arg Ala Cys Ala Ala Val
 35 40 45

Gly Val Val Val Thr His Val Ala Phe Gln Thr Gly His Ser Ser Gly
 50 55 60

Val Gly Gly Arg Leu Phe Gly Arg Phe Asp Leu Ala Val Ala Val Phe
 65 70 75 80

Phe Ala Val Ser Gly Phe Leu Leu Trp Arg Gly His Ala Ala Ala Ala
 85 90 95

Arg Asp Leu Arg Ser His Pro Arg Thr Gly Pro Tyr Leu Arg Ser Arg
 100 105 110

Val Ala Arg Ile Met Pro Ala Tyr Val Val Ala Val Val Val Ile Leu
 115 120 125

Ser Leu Leu Pro Asp Ala Asp His Ala Ser Leu Thr Val Trp Leu Ala
 130 135 140

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Asn Leu Thr Leu Thr Gln Ile Tyr Val Pro Leu Thr Leu Thr Gly Gly
 145 150 155 160

Leu Thr Gln Met Trp Ser Leu Ser Val Glu Val Ala Phe Tyr Ala Ala
 165 170 175

Leu Pro Val Leu Ala Leu Leu Gly Arg Arg Ile Pro Val Gly Ala Arg
 180 185 190

Val Pro Ala Ile Ala Ala Leu Ala Ala Leu Ser Trp Ala Trp Gly Trp
 195 200 205

Leu Pro Leu Asp Ala Gly Ser Gly Ile Asn Pro Leu Thr Trp Pro Pro
 210 215 220

Ala Phe Phe Ser Trp Phe Ala Ala Gly Met Leu Leu Ala Glu Trp Ala
 225 230 235 240

Tyr Ser Pro Val Gly Leu Pro His Arg Trp Ala Arg Arg Arg Val Ala
 245 250 255

Met Ala Val Thr Ala Leu Leu Gly Tyr Leu Val Ala Ala Ser Pro Leu
 260 265 270

Ala Gly Pro Glu Gly Leu Val Pro Gly Thr Ala Ala Gln Phe Ala Val
 275 280 285

Lys Thr Ala Met Gly Ser Leu Val Ala Phe Ala Leu Val Ala Pro Leu
 290 295 300

Val Leu Asp Arg Pro Asp Thr Ser His Arg Leu Leu Gly Ser Pro Ala
 305 310 315 320

Met Val Thr Leu Gly Arg Trp Ser Tyr Gly Leu Phe Ile Trp His Leu
 325 330 335

Ala Ala Leu Ala Met Val Phe Pro Val Ile Gly Ala Phe Pro Phe Thr
 340 345 350

Gly Arg Met Pro Thr Val Leu Val Leu Thr Leu Ile Phe Gly Phe Ala
 355 360 365

Ile Ala Ala Val Ser Tyr Ala Leu Val Glu Ser Pro Cys Arg Glu Ala
 370 375 380

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Leu Arg Arg Trp Glu Arg Arg Asn Glu Pro Ile Ser Val Gly Glu Leu
 385 390 395 400

Gln Ala Asp Ala Ile Ala Pro
 405

<210> 14

<211> 1221

<212> DNA

<213> Mycobacterium tuberculosis

<400> 14

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ggaatgcgcg catgcgcggc cgtcggcgtc gtggtcactc acgtcgcgtt ccagaccggg	180
cactctagcg gtgtgggcgg gcggctgttc ggccgcttcg atctggcggt ggcggtgttc	240
ttcgccgtgt cgggattctt gttgtggcgc ggacacgccg cagcggcgcg agatctgcgg	300
tcacaccgcg gaaccggtec gtatctgcga tcgcgggtgg cgcgcatcat gccggcctat	360
gtggtggcgg tggtcgtcat cctgtccctg ctgcccgaac cggatcatgc cagcctgacc	420
gtgtggctgg ccaacctgac gctcaccag atctatgtgc cgtgaccct gaccggcggc	480
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gcgctcagct gggcgtgggg ctggctcccg ttggacgccg ggtcggggat caaccgcttg	660
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tacagcccgg tcgggttgcc gcacgggtgg gcgcgccgcc gcgtggcgat ggcggttacc	780
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gtggcgccgc tgggtgctgga ccggcccgc acgtcgcacc ggctgctggg cagccccgcg	960
atggtgacct tgggcgcttg gtcctatggc ctgttcatct ggcactctggc cgcgctggcc	1020
atggtgtttc ccgtgatcgg agcgttcccg tttaccgggc gaatgccgac ggtgctgggtg	1080
ttgacgctga tcttcggttt cgcgatcgcc gcggtcagct acgccctggg cgagtcgccc	1140

-21-

tgccgggaag cgttgcgccg ctgggagcgc cgcaacgaac ccataatcggt cggcgaactt 1200
 caggcggacg cgattgcacc c 1221

<210> 15

<211> 381

<212> PRT

<213> Mycobacterium tuberculosis

<400> 15

Met Ala Gln Ala His Ser Ala Pro Leu Thr Gly Tyr Arg Ile Ala Val
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Thr Ser Ala Arg Arg Ala Glu Glu Leu Cys Ala Leu Leu Arg Arg Gln
 20 25 30

Gly Ala Glu Val Cys Ser Ala Pro Ala Ile Lys Met Ile Ala Leu Pro
 35 40 45

Asp Asp Asp Glu Leu Gln Asn Asn Thr Glu Ala Leu Ile Ala Asp Pro
 50 55 60

Pro Asp Ile Leu Val Ala His Thr Gly Ile Gly Phe Arg Gly Trp Leu
 65 70 75 80

Ala Ala Ala Glu Gly Trp Gly Leu Ala Asn Glu Leu Leu Glu Ser Leu
 85 90 95

Ser Ser Ala Arg Ile Ile Ser Arg Gly Pro Lys Ala Thr Gly Ala Leu
 100 105 110

Arg Ala Ala Gly Leu Arg Glu Glu Trp Ser Pro Asp Ser Glu Ser Ser
 115 120 125

His Glu Val Leu Glu Tyr Leu Leu Glu Ser Gly Val Ser Arg Thr Arg
 130 135 140

Ile Ala Val Gln Leu His Gly Ala Ala Asp Ser Trp Asp Pro Phe Pro
 145 150 155 160

Glu Phe Leu Gly Gly Leu Arg Phe Ala Gly Ala Gln Val Val Pro Ile

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	165		170		175
Arg Val Tyr	Arg Trp Lys Pro Ala	Pro Leu Gly Gly Val	Phe Asp His		
	180	185	190		
Leu Val Thr	Gly Ile Ala Arg Arg	Gln Phe Asp Ala Val	Thr Phe Thr		
	195	200	205		
Ser Ala Pro	Ala Ala Ala Ala Val	Leu Glu Arg Ser Arg	Glu Leu Asp		
	210	215	220		
Ile Glu Asp	Gln Leu Leu Ala Ala	Leu Arg Thr Asp Val	His Ala Met		
	225	230	235	240	
Cys Val Gly	Pro Val Thr Ser Arg	Pro Leu Ile Arg Lys	Gly Val Pro		
	245	250	255		
Thr Ser Ala	Pro Glu Arg Met Arg	Leu Gly Ala Leu Ala	Arg His Ile		
	260	265	270		
Ala Glu Glu	Leu Pro Leu Leu Gly	Ser Cys Thr Phe Lys	Ala Ala Gly		
	275	280	285		
His Val Ile	Glu Ile Arg Gly Thr	Ser Val Leu Val Asp	Asp Ser Val		
	290	295	300		
Lys Pro Leu	Ser Pro Ser Gly Met	Ala Ile Leu Arg Ala	Leu Val His		
	305	310	315	320	
Arg Pro Gly	Gly Val Val Ser Arg	Gly Asp Leu Leu Arg	Val Leu Pro		
	325	330	335		
Gly Asp Gly	Ser Asp Thr His Ala	Val Asp Thr Ala Val	Leu Arg Leu		
	340	345	350		
Arg Thr Ala	Leu Gly Asp Lys Asn	Ile Val Ala Thr Val	Val Lys Arg		
	355	360	365		
Gly Tyr Arg	Leu Ala Val Asp Ser	Arg His Asp Asp Val			
	370	375	380		

<210> 16

<211> 1143

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<212> DNA

<213> Mycobacterium tuberculosis

<400> 16

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gcgatcaaga tgatcgctt tcccgacgac gatgaactgc agaacaacac cgaggcggtg      180
atcgccgacc cgcctgacat tctggtcgcc cacaccggca tcggatttcg cggctgggtg      240
gccgcggccg aggggtgggg gctggccaac gagctcctgg aatcgttgtc gtcggccccg      300
atcatctccc gcggacaaa ggcaactggt gcgctgcgtg ccgccggcct gcgtgaagag      360
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tcccgtagcg gtattgccgt ccagctgcac ggtgccgccg acagctggga cccgtttccg      480
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gta                                             1143

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<210> 17

<211> 409

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 17

Met Ser Gln Ser Arg Tyr Ala Gly Leu Ser Arg Ser Glu Leu Ala Val
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Leu Leu Pro Glu Leu Leu Leu Ile Gly Gln Leu Ile Asp Arg Ser Gly
 20 25 30

Met Ala Trp Cys Ile Gln Ala Phe Gly Arg Gln Glu Met Leu Gln Ile
 35 40 45

Ala Ile Glu Glu Trp Ala Gly Ala Ser Pro Ile Tyr Thr Lys Arg Met
 50 55 60

Gln Lys Ala Leu Asn Phe Glu Gly Asp Asp Val Pro Thr Ile Phe Lys
 65 70 75 80

Gly Leu Gln Leu Asp Ile Gly Ala Pro Pro Gln Phe Met Asp Phe Arg
 85 90 95

Phe Thr Leu His Asp Arg Trp His Gly Glu Phe His Leu Asp His Cys
 100 105 110

Gly Ala Leu Leu Asp Val Glu Pro Met Gly Asp Asp Tyr Val Val Gly
 115 120 125

Met Cys His Thr Ile Glu Asp Pro Thr Phe Asp Ala Thr Ala Ile Ala
 130 135 140

Thr Asn Pro Arg Ala Gln Val Arg Pro Ile His Arg Pro Pro Arg Lys
 145 150 155 160

Pro Ala Asp Arg His Pro His Cys Ala Trp Thr Val Ile Ile Asp Glu
 165 170 175

Ser Tyr Pro Glu Ala Glu Gly Ile Pro Ala Leu Asp Ala Val Arg Glu
 180 185 190

Thr Lys Ala Ala Thr Trp Glu Leu Asp Asn Val Asp Ala Ser Asp Asp
 195 200 205

Gly Leu Val Asp Tyr Ser Gly Pro Leu Val Ser Asp Leu Asp Phe Gly
 210 215 220

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Ala Phe Ser His Ser Ala Leu Val Arg Met Ala Asp Glu Val Cys Leu
 225 230 235 240

Gln Met His Leu Leu Asn Leu Ser Phe Ala Ile Ala Val Arg Lys Arg
 245 250 255

Ala Lys Ala Asp Ala Gln Leu Ala Ile Ser Val Asn Thr Arg Gln Leu
 260 265 270

Ile Gly Val Ala Gly Leu Gly Ala Glu Arg Ile His Arg Ala Met Ala
 275 280 285

Leu Pro Gly Gly Ile Glu Gly Ala Leu Gly Val Leu Glu Leu His Pro
 290 295 300

Leu Leu Asn Pro Ala Gly Tyr Val Leu Ala Glu Thr Ser Pro Asp Arg
 305 310 315 320

Leu Val Val His Asn Ser Pro Ala His Ala Asp Gly Ala Trp Ile Ser
 325 330 335

Leu Cys Thr Pro Ala Ser Val Gln Pro Leu Gln Ala Ile Ala Thr Ala
 340 345 350

Val Asp Pro His Leu Lys Val Arg Ile Ser Gly Thr Asp Thr Asp Trp
 355 360 365

Thr Ala Glu Leu Ile Glu Ala Asp Ala Pro Ala Ser Glu Leu Pro Glu
 370 375 380

Val Leu Val Ala Lys Val Ser Arg Gly Ser Val Phe Gln Phe Glu Pro
 385 390 395 400

Arg Arg Ser Leu Pro Leu Thr Val Lys
 405

<210> 18

<211> 1227

<212> DNA

<213> Mycobacterium tuberculosis

-26-

<400> 18
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 ggccgccagg agatgctgca gatcgccatc gaggagtggg cgggcgccag cccgatctac 180
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 gaccgctggc acggcgagtt tcacctcgac cactgcggtg cgctgctoga cgtggagccg 360
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 accgcgatcg cgaccaaccc gcgcgcgcag gtgcgcccc aaccacggcc gccccgcaag 480
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 gaactgccgg aggtgttggt agccaaggtc agtcgcggat cggctcttcca gttcgagccg 1200
 aggcgctcac tgccgttgac cgtgaaa 1227

<210> 19

<211> 443

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 19

Val	Arg	Cys	Ser	Val	Phe	Gly	Thr	Gly	Tyr	Leu	Gly	Ala	Thr	His	Ala
1				5				10						15	

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Val Gly Met Ala Gln Leu Gly His Glu Val Val Gly Val Asp Ile Asp
 20 25 30

Pro Gly Lys Val Ala Lys Leu Ala Gly Gly Asp Ile Pro Phe Tyr Glu
 35 40 45

Pro Gly Leu Arg Lys Leu Leu Thr Asp Asn Leu Ala Ala Gly Arg Leu
 50 55 60

Arg Phe Thr Thr Asp Tyr Asp Met Ala Ala Asp Phe Ala Asp Val His
 65 70 75 80

Phe Leu Gly Val Gly Thr Pro Gln Lys Ile Gly Glu Tyr Gly Ala Asp
 85 90 95

Leu Arg His Val His Ala Val Ile Asp Ala Leu Val Pro Arg Leu Val
 100 105 110

Arg Ala Ser Ile Leu Val Gly Lys Ser Thr Val Pro Val Gly Thr Ala
 115 120 125

Ala Glu Leu Gly His Arg Ala Gly Ala Leu Ala Pro Arg Gly Val Asp
 130 135 140

Val Glu Ile Ala Trp Asn Pro Glu Phe Leu Arg Glu Gly Phe Ala Val
 145 150 155 160

His Asp Thr Leu Asn Pro Asp Arg Ile Val Leu Gly Val Gln Asp Asp
 165 170 175

Ser Thr Arg Ala Glu Val Ala Val Arg Glu Leu Tyr Ala Pro Leu Leu
 180 185 190

Ala Ala Gly Val Pro Phe Leu Val Thr Asp Leu Gln Thr Ala Glu Leu
 195 200 205

Val Lys Val Ser Ala Asn Ala Phe Leu Ala Thr Lys Ile Ser Phe Ile
 210 215 220

Asn Ala Ile Ser Glu Val Cys Glu Ala Ala Gly Ala Asp Val Ser Gln
 225 230 235 240

Leu Ala Asp Ala Leu Gly Tyr Asp Pro Arg Ile Gly Arg Gln Cys Leu

-28-

245

250

255

Asn Ala Gly Leu Gly Phe Gly Gly Gly Cys Leu Pro Lys Asp Ile Arg
 260 265 270

Ala Phe Met Ala Arg Ala Gly Glu Leu Gly Ala Asp Gln Ala Leu Thr
 275 280 285

Phe Leu Arg Glu Val Asp Ser Ile Asn Met Arg Arg Arg Thr Lys Met
 290 295 300

Val Glu Leu Ala Thr Thr Ala Cys Gly Gly Ser Leu Leu Gly Ala Asn
 305 310 315 320

Ile Ala Val Leu Gly Ala Ala Phe Lys Pro Glu Ser Asp Asp Val Arg
 325 330 335

Asp Ser Pro Ala Leu Asn Val Ala Gly Gln Leu Gln Leu Asn Gly Ala
 340 345 350

Thr Val His Val Tyr Asp Pro Lys Ala Leu Asp Asn Ala His Arg Leu
 355 360 365

Phe Pro Thr Leu Asn Tyr Ala Val Ser Val Ala Glu Ala Cys Glu Arg
 370 375 380

Ala Asp Ala Val Leu Val Leu Thr Glu Trp Arg Glu Phe Ile Asp Leu
 385 390 395 400

Glu Pro Ala Asp Leu Ala Asn Arg Val Arg Ala Arg Val Ile Val Asp
 405 410 415

Gly Arg Asn Cys Leu Asp Val Thr Arg Trp Arg Arg Ala Gly Trp Arg
 420 425 430

Val Phe Arg Leu Gly Val Pro Arg Leu Gly His
 435 440

<210> 20

<211> 1329

<212> DNA

<213> Mycobacterium tuberculosis

-29-

<400> 20
 gtgcgatgca gcgtcttcgg cactgggtat ctgggtgccca cccacgccgt cggatatggcg 60
 caactgggac acgaggtcgt cgggggtcgat atcgatcccc gtaaggctcg caagctcgcc 120
 ggggggtgaca ttccgttcta cgaaccggc ctgcgaaagc tgttgactga taacctggct 180
 gccggccgct tgcggttcac caccgactac gacatggcgg ccgatttcgc cgacgtgcat 240
 ttctctggggg tcggcacgcc gcaaaagata ggcgaatatg gcgccgacct gcggcatgtc 300
 cacgccgtca tcgatgcgt ggtgccgcgt ctggtcaggg cgtcgattct ggtcggcaag 360
 tcgacagtcc cagtgggcac cgcagccgaa ctgggacatc gggccggtgc actggcacc 420
 cggggagtcg acgtggaaat tgcctggaat ccggaattcc tgcgcgaggg cttcgcggtg 480
 cacgacacc tcaacccga ccgtatcgtc cttgggggtac aagatgattc gacgcgcgcc 540
 gaggtagccg tccgcgagct gtacgcgcgc ctgctggcag cgggcgtgcc gtttctgggtg 600
 accgatctgc agaccgcgga gttgggtcaag gtatccgccca atgcctttct ggcgaccaag 660
 atttcgttta tcaatgcgat ctccgaagtg tgcgaggcgg cgggtgccga cgtagccag 720
 ctggccgatg cgctcggata cgaccgcgg atcggacgcc aatgcctcaa cgcgggcttg 780
 ggtttcggcg gcggctgctt gcccaaggac atccgcgctt tcatggcccg cgcggcgaa 840
 ctgggagccg accaggcgtt gacgttcctg cgtgaagtgg acagcatcaa catgcgcgg 900
 cgcaccaaga tgggtggaact ggccaccacc gcatgcggtg gctcgttgct ggcgcgcaat 960
 attgcggtgc tcggcgcggc gttcaaacc gaatccgatg acgtgcgca ttcgcccgcc 1020
 ctcaatgtgg cgggccagct gcagctcaac ggcgccacgg tccacgtgta cgatccaaag 1080
 gccttggaaca acgcccaccg actgttcctt accttgaact atgcggtttc ggttgcggag 1140
 gcctgcgagc gcgcggacgc cgtgttggtg cttaccgaat ggcgggagtt catcgatctc 1200
 gaaccgcgtg atctagccaa ccgggtgcgg gcccggtga tcgtggacgg ccgcaactgc 1260
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 ttagggcac 1329

<210> 21

<211> 74

<212> PRT

<213> *Mycobacterium tuberculosis*

-30-

<400> 21

Val Gly Pro Lys Gly Ser Leu Arg Leu Val Lys Arg Gln Pro Glu Leu
 1 5 10 15

Leu Val Ala Gln His Glu His Trp Gln Asp Thr Tyr Arg Ala His Pro
 20 25 30

Val Leu Tyr Gly Thr Arg Pro Ser Glu Pro Gly Val Tyr Ala Ala Glu
 35 40 45

Val Phe Asn Ala Asp Gly Val Gln Arg Val Leu Glu Leu Ala Ala Gly
 50 55 60

His Gly Arg Asp Thr Leu Tyr Phe Ala Gly
 65 70

<210> 22

<211> 222

<212> DNA

<213> Mycobacterium tuberculosis

<400> 22

gtggggccga aggggaagtct acgtttggtg aagcggcagc cagaactgct cgttgcccag 60
 catgaacact ggcaggacac ctaccgagcg catccggtgc tgtacggaac ccgcccgtca 120
 gagccggggg tatatgccgc cgaggtgttc aatgccgacg gcgtgcagcg ggtgctggag 180
 ttggcgggcg gtcatgggcg tgacaccctg tatttcgctg gc 222

<210> 23

<211> 419

<212> PRT

<213> Mycobacterium tuberculosis

<400> 23

Val Ile Asp Gly Trp Thr Glu Glu Gln His Glu Pro Thr Val Arg His
 1 5 10 15

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Glu Arg Pro Ala Ala Pro Gln Asp Val Arg Arg Val Met Leu Leu Gly
 20 25 30

Ser Ala Glu Pro Ser Arg Glu Leu Ala Ile Ala Leu Gln Gly Leu Gly
 35 40 45

Ala Glu Val Ile Ala Val Asp Gly Tyr Val Gly Ala Pro Ala His Arg
 50 55 60

Ile Ala Asp Gln Ser Val Val Val Thr Met Thr Asp Ala Glu Glu Leu
 65 70 75 80

Thr Ala Val Ile Arg Arg Leu Gln Pro Asp Phe Leu Val Thr Val Thr
 85 90 95

Ala Ala Val Ser Val Asp Ala Leu Asp Ala Val Glu Gln Ala Asp Gly
 100 105 110

Glu Cys Thr Glu Leu Val Pro Asn Ala Arg Ala Val Arg Cys Thr Ala
 115 120 125

Asp Arg Glu Gly Leu Arg Arg Leu Ala Ala Asp Gln Leu Gly Leu Pro
 130 135 140

Thr Ala Pro Phe Trp Phe Val Gly Ser Leu Gly Glu Leu Gln Ala Val
 145 150 155 160

Ala Val His Ala Gly Phe Pro Leu Leu Val Ser Pro Val Ala Gly Val
 165 170 175

Ala Gly Gln Gly Ser Ser Val Val Ala Gly Pro Asn Glu Val Glu Pro
 180 185 190

Ala Trp Gln Arg Ala Ala Gly His Gln Val Gln Pro Gln Thr Gly Gly
 195 200 205

Val Ser Pro Arg Val Cys Ala Glu Ser Val Val Glu Ile Glu Phe Leu
 210 215 220

Val Thr Met Ile Val Val Cys Ser Gln Gly Pro Asn Gly Pro Leu Ile
 225 230 235 240

Glu Phe Cys Ala Pro Ile Gly His Arg Asp Ala Asp Ala Gly Glu Leu
 245 250 255

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Glu Ser Trp Gln Pro Gln Lys Leu Ser Thr Ala Ala Leu Asp Ala Ala
 260 265 270

Lys Ser Ile Ala Ala Arg Ile Val Lys Ala Leu Gly Gly Arg Gly Val
 275 280 285

Phe Gly Val Glu Leu Met Ile Asn Gly Asp Glu Val Tyr Phe Ala Asp
 290 295 300

Val Thr Val Cys Pro Ala Gly Ser Ala Trp Val Thr Val Arg Ser Gln
 305 310 315 320

Arg Leu Ser Val Phe Glu Leu Gln Ala Arg Ala Ile Leu Gly Leu Ala
 325 330 335

Val Asp Thr Leu Met Ile Ser Pro Gly Ala Ala Arg Val Ile Asn Pro
 340 345 350

Asp His Thr Ala Gly Arg Ala Ala Val Gly Ala Ala Pro Pro Ala Asp
 355 360 365

Ala Leu Thr Gly Ala Leu Gly Val Pro Glu Ser Asp Val Val Ile Phe
 370 375 380

Gly Arg Gly Leu Gly Val Ala Leu Ala Thr Ala Pro Glu Val Ala Ile
 385 390 395 400

Ala Arg Glu Arg Ala Arg Glu Val Ala Ser Arg Leu Asn Val Pro Asp
 405 410 415

Ser Arg Glu

<210> 24

<211> 1257

<212> DNA

<213> Mycobacterium tuberculosis

<400> 24

gtgatcgacg gctggacgga agaacagcac gaaccacccg ttaggcatga ggcgccagca 60

-33-

gctccccaag acgttcggcg ggtgatgttg ctgggttcgg ccgaaccag ccgggagctg 120
 gcgatcgctg tgcagggctt gggcgcgag gtgatcgccg tcgacggcta tgtcggcgcg 180
 cctgcccacc ggatagccga ccagtcggtg gtggtcacca tgaccgatgc tgaagagctg 240
 acggcggtga tccggcggtt gcaaccgat ttcttggtga cggtcaccgc cgcggtgtct 300
 gtggatgctc tcgatgccgt cgagcaagcc gacggcgagt gcactgagct ggtgcccgaac 360
 gcccggtccg tccggtgcac ggccgaccgg gagggcctgc gccggctggc cgcgatcag 420
 ctgggcctgc ccacagcccc gttctggttc gtcggatccc ttggcgaact tcaagcgggtg 480
 gccgtccatg ctgggtttcc gttgctggtg agcccgggtg caggggtggc tggccagggg 540
 agctcgggtg tcgccgggccc caacgaggtc gagcccgctt ggcagcgcg cgcaggccat 600
 caagtacagc cgcagactgg gggagtgagc cctcgggtgt gcgccgagtc ggtggtcgag 660
 atcgagtttt tggtcaccat gatcgttgtg tgcagtcagg gcccgaaagg gccgctcatc 720
 gagttctgtg cacctatcgg tcatcgcgac gccgatgccg gtgagttgga atcctggcaa 780
 ccgcagaagc tgagcacggc ggcgctggac gcggccaagt cgatcgccgc gcgcacgctc 840
 aaggcgctcg ggggacgcgg ggttttcggc gtcgaattga tgatcaacgg cgatgaggtg 900
 tatttcgccc atgtcacctg gtgtcctgcc gggagtgcct gggtcaccgt gcgcagccag 960
 cggttttcgg tgttcgaact gcaggcccgg gcgatcctgg gtctggcggt ggacaccctg 1020
 atgatctcgc cgggtgccgc gcgggtgatc aaccgggacc acacggcagg ccgggcagcg 1080
 gtcggcgccc caccacctgc cgatgcgctg accggtgcgc tcggtgtgcc ggaaagcgac 1140
 gtcgtgatat tcggccgcgg gcttgggggtg gcgctggcca ccgcacccga ggtggcaatc 1200
 gcccgogaac gcgcccgcga agttgcatct cggctaaatg tgccagactc acgcgag 1257

<210> 25

<211> 140

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 25

Val	Ser	Tyr	Ala	Gly	Asp	Ile	Thr	Pro	Leu	Gln	Ala	Trp	Glu	Met	Leu
1				5				10					15		

Ser	Asp	Asn	Pro	Arg	Ala	Val	Leu	Val	Asp	Val	Arg	Cys	Glu	Ala	Glu
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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	20		25		30
Trp	Arg	Phe	Val	Gly	Val
	35		40		45
Val	Tyr	Val	Glu	Trp	Ala
	50		55		60
Leu	Ala	Glu	Leu	Arg	Asp
	65		70		75
Arg	Pro	Val	Ile	Phe	Leu
			85		90
Ala	Glu	Val	Ala	Thr	Glu
			100		105
Asp	Gly	Phe	Glu	Gly	His
	115		120		125
Gly	Trp	Arg	Ala	Val	Gly
	130		135		140

<210> 26

<211> 420

<212> DNA

<213> Mycobacterium tuberculosis

<400> 26	
gtgagctacg ccggagatat cacgccactt caggcctggg agatgctcag cgataatccg	60
cgggcggtcc tggtcgacgt gcgctgcgag gcggaatggc gcttcgctcg tgtgcccgcac	120
ttgtcgagcc ttggctcgtga agtggctctat gtcgaatggg cgacgtccga cgggacgcac	180
aacgacaact tcctcgccga gttgcgggac cgcaccccg cggacgctga tcagcacgag	240
cggcccgtta ttttcttggt tcgctccggt aaccgctcca tcggcgcggc cgaggtcgcg	300
accgaggcgg gcatcacgcc ggcctataac gtgctggacg gcttcgaagg gcatctcgac	360
gctgagggtc atcgaggcgc aacgggctgg cgggcggtgg gactgccgtg gagacagggg	420

<210> 27

-35-

<211> 134

<212> PRT

<213> Mycobacterium tuberculosis

<400> 27

Met Asp Trp Met Pro Leu Gly Asp Tyr Glu Thr Phe Arg His Trp Ser
 1 5 10 15

Gly Lys Pro Arg Ala Trp Gly Pro Gln Glu Ser Gly Trp Arg Ala Trp
 20 25 30

Phe Gly Gly Lys Ile Val Asp Gly Leu Cys Glu Val Leu Asp Glu His
 35 40 45

Leu Ala Val Arg Arg Arg Gly Val Pro Ala Ala Ile Gly Cys Val Pro
 50 55 60

Trp Leu Ser Ser Glu Ala Val Ala Glu Thr Leu Leu Ala Leu Ser Val
 65 70 75 80

Phe Cys Val Val Ile Asp Lys Gly Thr Ser Phe Pro Ser Arg Leu Arg
 85 90 95

Asn Pro Asp Lys Gly Phe Pro Asn Val Ala Leu Leu Arg Leu Arg Asp
 100 105 110

Met Ala Pro Ser Glu His Gly Ser Arg Cys Ser Ser Ala Arg Gly Arg
 115 120 125

Leu Cys Leu Ser Met Ser
 130

<210> 28

<211> 402

<212> DNA

<213> Mycobacterium tuberculosis

<400> 28

atggattgga tgccgctcgg cgactacgag actttccggc attggtcggg gaagccccgc 60

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```

gcatgggggc cgcaagagtc ggggtggcgc gcgtgggttcg gcgggaagat agtcgatggg      120
ctctgcgagg tactcgacga gcacctcgcg gtgcggcgtc gtgggtgttcc agccgcgata      180
ggctgcgctgc cctggctgag tagcgaggcg gtcgccgaga cgctgctcgc attgagcgtc      240
ttttgcgtgg tgatcgacaa gggaacctcg ttcccgctgc gactgcgtaa cctgacaaa      300
gggtttccca acgtcgccct attgcggctt cgcgacatgg cgccctccga gcatgggtca      360
cgctgctcct cggcccgctg tcgtctatgc ctgagcatga gc                          402

```

<210> 29

<211> 340

<212> PRT

<213> Mycobacterium tuberculosis

<400> 29

```

Val Pro Ala Cys Pro Ala Pro Ala Arg Ala Gly Thr Ala Arg Ser Ser
1           5           10           15

```

```

Pro Gly Ala Ser Trp Ile Ala Arg Leu Leu Arg Ala Pro Val Arg Arg
          20           25           30

```

```

Ala Arg Arg Arg Ala Gln Ala Gly Leu Pro Gly Ser Cys Ala Arg Arg
35           40           45

```

```

Cys Gly Ala Leu Val Ala Gly Pro Arg Leu Ala Arg Met Arg Ile Ala
50           55           60

```

```

Leu Ala Gln Ile Arg Ser Gly Thr Asp Pro Ala Ala Asn Leu Gln Leu
65           70           75           80

```

```

Val Gly Lys Tyr Ala Gly Glu Ala Ala Thr Ala Gly Ala Gln Leu Val
          85           90           95

```

```

Val Phe Pro Glu Ala Thr Met Cys Arg Leu Gly Val Pro Leu Arg Gln
100           105           110

```

```

Val Ala Glu Pro Val Asp Gly Pro Trp Ala Asn Gly Val Arg Arg Ile
115           120           125

```

```

Ala Thr Glu Ala Gly Ile Thr Val Ile Ala Gly Met Phe Thr Pro Thr

```

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130	135	140
Gly Asp Gly Arg Val Thr Asn Thr Leu Ile Ala Ala Gly Pro Gly Thr		
145	150	155 160
Pro Asn Gln Pro Asp Ala His Tyr His Lys Ile His Leu Tyr Asp Ala		
	165	170 175
Phe Gly Phe Thr Glu Ser Arg Thr Val Ala Pro Gly Arg Glu Pro Val		
	180	185 190
Val Val Val Val Asp Gly Val Arg Val Gly Leu Thr Val Cys Tyr Asp		
	195	200 205
Ile Arg Phe Pro Ala Leu Tyr Thr Glu Leu Ala Arg Arg Gly Ala Gln		
	210	215 220
Leu Ile Ala Val Cys Ala Ser Trp Gly Ser Gly Pro Gly Lys Leu Glu		
	225	230 235 240
Gln Trp Thr Leu Leu Ala Arg Ala Arg Ala Leu Asp Ser Met Ser Tyr		
	245	250 255
Val Ala Ala Ala Gly Gln Ala Asp Pro Gly Asp Ala Arg Thr Gly Val		
	260	265 270
Gly Ala Ser Ser Ala Ala Pro Thr Gly Val Gly Gly Ser Leu Val Ala		
	275	280 285
Ser Pro Leu Gly Glu Val Val Val Ser Ala Gly Thr Gln Pro Gln Leu		
	290	295 300
Leu Val Ala Asp Ile Asp Val Asp Asn Val Ala Ala Ala Arg Asp Arg		
	305	310 315 320
Ile Ala Val Leu Arg Asn Gln Thr Asp Phe Val Gln Ile Asp Lys Ala		
	325	330 335
Gln Ser Arg Gly		
	340	

<210> 30

<211> 1020

-38-

<212> DNA

<213> Mycobacterium tuberculosis

<400> 30

```

gtgccagctt gcccggtcc tgcgcgcgcc ggtacggcgc gctcgtcgcc gggcgcaagc      60
tggattgccc ggctcctgcg cgcgccggtg cggcgcgctc gtcgccgggc gcaagctgga      120
ttgcccggtc cctgcgcgcg ccggtgcggc gcgctcgtcg ccgggcctag gctggcgcgc      180
atgcgaatcg cgttggcgca aatccgcagc ggtaccgacc ccgccgcaa tctgcaactg      240
gtcggcaagt acgccggcga agccgccacc gcgggcgcac agctggtggt gtttcctgag      300
gcgaccatgt gccggctcgg tgtcccgtg cggcaggtcg ccgagcccg cgcaggaccc      360
tgggcaaacg gagtccgacg gatcgcgacc gaggcgggca tcaccgtgat cgcggcatg      420
ttcaccccga ccggcgacgg gcgggtaaca aacacgctga tcgcagccgg cccgggcacg      480
cccaatcagc cggacgcgca ctaccacaag atccacctct atgacgcggt cggcttcacc      540
gagtcacgta ccgtcgcacc cgggcgcgaa ccggtggtag tcgtggtcga cggcgtgcgg      600
gtgggtttga ccgtttgcta cgacattcgc tttcccgccc tttataccga gctggcgcgg      660
cgcggggccc aactgatcgc ggtctgtgca tcctgggggt ccggtccggg caaactcgaa      720
cagtggacgt tgctggcccc cggccgggcg ctagactcca tgagttacgt cgcgcggccc      780
ggccaagcag acccaggtga tgccgcacc ggcgtggggg cgagctcggc tgcaccgacc      840
ggggtaggcg gcagcctggt ggcctcgccg ctaggcgagg tgggtggtgc agctggcacc      900
cagccgcaac tgctggtcgc cgacatcgat gtcgacaatg tggccgcggc tcgcgaccgc      960
attgcggtgc tacgcaacca gacagacttc gttcagatcg ataaggcaca atcgcgtggg     1020

```

<210> 31

<211> 329

<212> PRT

<213> Mycobacterium tuberculosis

<400> 31

```

Val Gly Glu Ser Thr Thr Gln Pro Ala Gly Gly Ala Ala Val Asp Asp
1           .5           10           15

```

-39-

Glu Thr Arg Ser Ala Ala Leu Pro Arg Trp Arg Gly Ala Ala Gly Arg
 20 25 30

Leu Glu Val Trp Tyr Ala Thr Leu Ser Asp Pro Leu Thr Arg Thr Gly
 35 40 45

Leu Trp Val His Cys Glu Thr Val Ala Pro Thr Thr Gly Gly Pro Tyr
 50 55 60

Ala His Gly Trp Val Thr Trp Phe Pro Pro Asp Ala Pro Pro Gly Thr
 65 70 75 80

Glu Arg Phe Gly Pro Gln Pro Ala Gln Pro Ala Ala Gly Pro Ala Trp
 85 90 95

Phe Asp Ile Ala Gly Val Arg Met Ala Pro Ala Glu Leu Thr Gly Arg
 100 105 110

Thr Arg Ser Leu Ala Trp Glu Leu Ser Trp Lys Asp Thr Ala Ala Pro
 115 120 125

Leu Trp Thr Phe Pro Arg Val Ala Trp Glu Arg Glu Leu Leu Pro Gly
 130 135 140

Ala Gln Val Val Ile Ala Pro Thr Ala Val Phe Ala Gly Ser Leu Ala
 145 150 155 160

Val Gly Glu Thr Thr His Arg Val Asp Ser Trp Arg Gly Ser Val Ala
 165 170 175

His Ile Tyr Gly His Gly Asn Ala Lys Arg Trp Gly Trp Ile His Ala
 180 185 190

Asp Leu Gly Asp Gly Asp Val Leu Glu Val Val Thr Ala Val Ser His
 195 200 205

Lys Pro Gly Leu Arg Arg Leu Ala Pro Leu Ala Phe Val Arg Phe Arg
 210 215 220

Ile Asp Gly Lys Asp Trp Pro Ala Ser Pro Leu Pro Ser Leu Arg Met
 225 230 235 240

Arg Thr Thr Leu Gly Val Arg His Trp Gln Leu Glu Gly Arg Ile Gly
 245 250 255

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Gly Arg Glu Ala Leu Ile Arg Val Asp Gln Pro Pro Glu Arg Cys Val
 260 265 270

Ser Leu Gly Tyr Thr Asp Pro Asp Gly Ala Lys Ala Val Cys Thr Asn
 275 280 285

Thr Glu Gln Ala Asp Ile His Ile Glu Leu Gly Gly Arg His Trp Ser
 290 295 300

Val Leu Gly Thr Gly His Ala Glu Val Gly Leu Arg Gly Thr Ala Ala
 305 310 315 320

Pro Ala Ile Lys Glu Gly Thr Pro Ala
 325

<210> 32

<211> 987

<212> DNA

<213> Mycobacterium tuberculosis

<400> 32

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gtgggccaat cgacaactca gccagcagga ggtgccgcag tggacgatga aacgcggctcg      60
gcggccttgc cgcggtggcg cggcgcagcc gggcgccctgg aagtctggta tgcgactctg      120
tcggatccac tgacgcgtac cggcctatgg gtgcactgtg agacggtggc cccgacgacc      180
ggcggggcct acgcgcacgg ctgggtgacc tggtttccac cggatgcccc gccgggcacc      240
gagcgcttcg gccccagcc cgcccaaccc gcggccggcc ccgcctgggt cgacatcgcc      300
ggtgtacgaa tggcgccagc ggagctgacc ggacgtaccc gatcactcgc atgggagctg      360
tcctggaagg acaccgcggc gccactgtgg acgtttcctc gcgtggcctg ggagcgcgag      420
ttgctgcccc gcgccaagt ggtgatcgca cccacgcgcg tcttcgctgg ctccctggcc      480
gtcggcgaaa ccaccaccg cgtcgacagc tggcgcgga gtgtggcca catctacgga      540
catggcaatg ccaagcgggt gggatggatc catgccgatc tcggcgacgg cgacgtccta      600
gaggtggtga ccgcggtatc acacaagccg ggcctacgca ggctcgcgcc gctagcgttc      660
gttcgcttcc gcacgcaggg aaaggattgg cccgcaagtc ctttaccgtc gctgcgaatg      720
cggacaacgc tcggcgtgcg gcactggcaa ctggaaggac gcatcggcgg ccgggaggcg      780

```

-41-

ctaataccggg tagaccagcc gccggagcgg tgcgtaagcc tgggatacac cgatcccgac 840
 gggggccaagg cgggtgtgcac caacaccgag caggccgaca tccacatcga gctcggcggc 900
 cggcactggt cgggtgctggg caccggacac gccgaagtcg gcctgcgggg aaccgcggca 960
 ccggctatca aggaaggac gccagca 987

<210> 33

<211> 292

<212> PRT

<213> Mycobacterium tuberculosis

<400> 33

Val Ala Ser Phe Ala Gln Trp Val Ser Gly Ala Arg Pro Arg Thr Leu
 1 5 10 15

Pro Asn Ala Ile Ala Pro Val Val Ala Gly Thr Gly Ala Ala Ala Trp
 20 25 30

Leu His Ala Ala Val Trp Trp Lys Ala Leu Leu Ala Leu Ala Val Ala
 35 40 45

Val Ala Leu Val Ile Gly Val Asn Tyr Ala Asn Asp Tyr Ser Asp Gly
 50 55 60

Ile Arg Gly Thr Asp Asp Asp Arg Val Gly Pro Val Arg Leu Val Gly
 65 70 75 80

Ser Arg Leu Ala Thr Pro Arg Ser Val Leu Thr Ala Ala Met Thr Ser
 85 90 95

Leu Ala Leu Gly Ala Leu Ala Gly Leu Val Leu Ala Leu Leu Ser Ala
 100 105 110

Pro Trp Leu Ile Ala Val Gly Ala Ile Cys Ile Ala Gly Ala Trp Leu
 115 120 125

Tyr Thr Gly Gly Ser Lys Pro Tyr Gly Tyr Ala Gly Phe Gly Glu Leu
 130 135 140

Ala Val Phe Val Phe Phe Gly Pro Val Ala Val Leu Gly Thr Gln Tyr

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145	150	155	160
Thr Gln Ala Leu Arg Val Asp Trp Val Gly Leu Ala Gln Ala Val Ala			
	165	170	175
Thr Gly Ala Leu Ser Cys Ser Val Leu Val Ala Asn Asn Leu Arg Asp			
	180	185	190
Ile Pro Thr Asp Ala Arg Ala Asp Lys Ile Thr Leu Ala Val Arg Leu			
	195	200	205
Gly Asp Ala Arg Thr Arg Met Leu Tyr Gln Gly Leu Leu Ala Val Ala			
	210	215	220
Gly Val Leu Thr Phe Val Leu Met Leu Ala Thr Pro Trp Cys Val Val			
	225	230	235
Gly Leu Val Ala Ala Pro Leu Ala Leu Arg Ala Ala Gly Pro Val Arg			
	245	250	255
Ser Gly Arg Gly Gly Arg Glu Leu Ile Pro Val Leu Arg Asp Thr Gly			
	260	265	270
Leu Ala Met Leu Val Trp Ala Leu Ala Val Ala Gly Ala Leu Ala Phe			
	275	280	285
Gly Gln Leu Ser			
	290		

<210> 34

<211> 876

<212> DNA

<213> Mycobacterium tuberculosis

<400> 34

gtggccagtt tcgcacagtg ggtctccggc gcgcggcccc gaacgctgcc gaacgcgatc	60
gcgccagtgg ttgccggcac cggcgccgcg gcctggctgc acgcggccgt gtggtggaaa	120
gcgctgttgg cactggctgt tgcggtggcg ctggtcattg ggggtcaatta cgccaatgac	180
tactccgacg gcatccgcgg caccgatgac gacaggggtg gtccggtgcg gttggtgggc	240

-43-

```

tcgcggctgg cgaccccgcg ctcggtgctg accgctgcca tgacgagcct ggcgctcggt 300
gcgctggccg ggctggtttt ggcgctgctc agcgcgccgt ggctgattgc ggtgggtgcg 360
atctgcatcg ccggggcctg gctctacacc ggcgggtcaa aaccctacgg ctatgcgggc 420
ttcggcgaac tggcgggtgtt tgtgtttctt gggccggctg ccgtgctcgg taccagtag 480
acgcaggcat tgccgggtgga ctgggtgggg ctggcacagg cggtagcaac gggtagcgtt 540
tcgtgctcgg tgcgtggtggc caacaacctg cgcgacatcc ccaccgacgc gcgggcccgc 600
aagatcacgc tggcgggtgcg gctgggagac gcccggaacc ggatgcttta ccagggcctg 660
ctggcggctg ccgggggtgct gacgttcctg ctaatgctgg ccacgccgtg gtgtgtggtg 720
ggcttggtgg ccgcgccttt ggcgctgcgc gctgccggac cggtagcgtc cgggcgcggc 780
gggcgcgagc tgatcccgtt actgcgtgac actgggctgg ccatgctggt gtgggcgttg 840
gcggtgccgg gggcattggc gtttggtcag ttgagc 876

```

<210> 35

<211> 378

<212> PRT

<213> Mycobacterium tuberculosis

<400> 35

```

Val Cys Gly Val Arg Val Ala Ile Val Ala Glu Ser Phe Leu Pro Gln
1           5           10          15

```

```

Val Asn Gly Val Ser Asn Ser Val Val Lys Val Leu Glu His Leu Arg
          20          25          30

```

```

Arg Thr Gly His Glu Ala Leu Val Ile Ala Pro Asp Thr Pro Pro Gly
          35          40          45

```

```

Glu Asp Arg Ala Glu Arg Leu His Asp Gly Val Arg Val His Arg Val
          50          55          60

```

```

Pro Ser Arg Met Phe Pro Lys Val Thr Thr Leu Pro Leu Gly Val Pro
        65          70          75          80

```

```

Thr Phe Arg Met Leu Arg Ala Leu Arg Gly Phe Asp Pro Asp Val Val
          85          90          95

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His Leu Ala Ser Pro Ala Leu Leu Gly Tyr Gly Gly Leu His Ala Ala
 100 105 110

Arg Arg Leu Gly Val Pro Thr Val Ala Val Tyr Gln Thr Asp Val Pro
 115 120 125

Gly Phe Ala Ser Ser Tyr Gly Ile Pro Met Thr Ala Arg Ala Ala Trp
 130 135 140

Ala Trp Phe Arg His Leu His Arg Leu Ala Asp Arg Thr Leu Ala Pro
 145 150 155 160

Ser Thr Ala Thr Met Glu Ser Leu Ile Ala Gln Gly Ile Pro Arg Val
 165 170 175

His Arg Trp Ala Arg Gly Val Asp Val Gln Arg Phe Ala Pro Ser Ala
 180 185 190

Arg Asn Glu Val Leu Arg Arg Arg Trp Ser Pro Asp Gly Lys Pro Ile
 195 200 205

Val Gly Phe Val Gly Arg Leu Ala Pro Glu Lys His Val Asp Arg Leu
 210 215 220

Thr Gly Leu Ala Ala Ser Gly Ala Val Arg Leu Val Ile Val Gly Asp
 225 230 235 240

Gly Ile Asp Arg Ala Arg Leu Gln Ser Ala Met Pro Thr Ala Val Phe
 245 250 255

Thr Gly Ala Arg Tyr Gly Lys Glu Leu Ala Glu Ala Tyr Ala Ser Met
 260 265 270

Asp Val Phe Val His Ser Gly Glu His Glu Thr Phe Cys Gln Val Val
 275 280 285

Gln Glu Ala Leu Ala Ser Gly Leu Pro Val Ile Ala Pro Asp Ala Gly
 290 295 300

Gly Pro Arg Asp Leu Ile Thr Pro His Arg Thr Gly Leu Leu Leu Pro
 305 310 315 320

Val Gly Glu Phe Glu His Arg Leu Pro Asp Ala Val Ala His Leu Val
 325 330 335

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His Glu Arg Gln Arg Tyr Ala Leu Ala Ala Arg Arg Ser Val Leu Gly
 340 345 350

Arg Ser Trp Pro Val Val Cys Asp Glu Leu Leu Gly His Tyr Glu Ala
 355 360 365

Val Arg Gly Arg Arg Thr Thr Gln Ala Ala
 370 375

<210> 36

<211> 1134

<212> DNA

<213> Mycobacterium tuberculosis

<400> 36

gtgtgtggcg tgcgcgttgc gatcgctcgcc gagtcgttcc tcccgcaggt gaacggcgctc 60
 agcaactcgg tggtaaggt actcgaacat ctgcgtcgaa ccggtcatga agccctgggtg 120
 atcgcgcccc acacgccgcc aggtgaagac cgcgcgcgagc gacttcacga cgggtgtccgg 180
 gtgcaccggg tgccgtcgcg gatgttccca aaggtgacca cgttgccgct cggcgtgccc 240
 accttccgaa tgctgagagc gctgcgcgga ttcgatccgg atgtcgtgca tctggcgctcg 300
 ccggcgctgc ttggctacgg tggactccat gccgctcggc ggctaggggt gccacggtc 360
 gcgggtctacc aaaccgatgt tccgggtttc gcgtccagct acggcattcc gatgacagca 420
 cgggcggcgt gggcatggtt ccgccacttg catcgctgg ctgaccgcac tctggcgccg 480
 tccacagcga caatggaatc ccttattgcc cagggcattc cgcgagtaca ccgggtgggca 540
 cgcgggggtg acgtgcaacg ttctgcgcgcg tcggcgcgaa acgaggtgtt gaggcgacgg 600
 tggtcaccgg acggcaaacc catcgctcggc tttgtgggtc ggcttgctcc ggagaagcat 660
 gtcgaccggc tcacgggtct ggccggcctcc ggccgcgtgc ggctgggtgat cgtcggcgac 720
 ggcatcgacc gggcaagatt gcaatcagca atgcccacag cggttttcac cggagcacgg 780
 tatggcaaag agctcgccga ggcgatatgcc agcatggacg tcttcgtaca ttccggtgag 840
 caogagacgt tctgccaagt cgtgcaggaa gcgctggcgt cggggctacc ggtgatcgct 900
 ccggacgccg gcggaccgcg tgatctgata acccgcacc gcaccgggct gctgttgccg 960
 gtccggcgagt tcgagcaccg gcttccctgac gccgctcgcc acctggtgca cgaacgccag 1020

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cgctacgcg c tggccgccc ggcagtggt ctgggccgca gttggccggt ggtctgcat 1080
gagctgctcg gccactacga ggcggtgcga ggtcggcgca cgacccaggc cgcg 1134

<210> 37

<211> 330

<212> PRT

<213> Mycobacterium tuberculosis

<400> 37

Leu Pro Ala Ile Pro Phe Gln Gly Glu Ala Arg Ala Gly Arg Arg Pro
1 5 10 15

Gly Arg Pro Arg Arg Cys Pro Ala Gly Val Val Arg Cys Arg Pro Arg
20 25 30

Ser Met Gly His Val Arg Pro Gly Phe Ser Pro Arg Leu Gly Ser His
35 40 45

Arg Thr Leu Arg Pro Arg Trp Pro Pro Tyr Ala Ala Ala Ser Arg Gly
50 55 60

Leu Thr Ser Gly Thr Ser Arg Trp Gly Trp Pro Arg Leu Gly Phe Gly
65 70 75 80

Val Val Thr Ala Pro Thr Arg Trp Thr Leu Ala Asp Gly Arg Glu Leu
85 90 95

Leu Phe Phe Ser Leu Pro Gly Pro Arg Thr Ser Gly Thr Ala Ala Glu
100 105 110

Arg Val Ala Arg His Ala Gln Ala Gln Thr Phe Ala Gly Asp Ile Arg
115 120 125

Gln Arg Ala Ile Gln Leu Val Val Ser Glu Gln Glu Val Ala Ser Lys
130 135 140

Ile Thr Ala Ala Thr Ala Gly Ile Ala Thr Thr Thr Phe Pro Glu Thr
145 150 155 160

Pro Ser Ile Asp Asp Thr Ile Ile Gly Asn Asp Asn Arg Asp Thr Gly

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165 170 175
 Val Arg Leu Val Asp Val Lys Gln Asp Gly Gly Thr Ser Pro Pro Pro
 180 185 190
 Pro Phe Ala Pro Trp Asp Thr Pro Asp Gly Thr Pro Pro Pro Gly Thr
 195 200 205
 Gly Leu Ser Pro Thr Leu Gln Gln Met Ile Leu Gly Gly Asp Pro Ala
 210 215 220
 Asn Leu Thr Gly Gln Gly Leu Ala Asp Asn Val Gln Arg Phe Val Gln
 225 230 235 240
 Ser Leu Pro Ala Asn Asp Pro Asn Thr Ala Trp Leu Arg Gly Gln Val
 245 250 255
 Ala Asp Leu Gln Ala His Val Ala Asp Ile Glu Tyr Ala Arg Thr His
 260 265 270
 Cys Ser Thr Asn Asp Trp Ile Asp Arg Thr Ala Gln Phe Ala Ser Gly
 275 280 285
 Ala Ile Val Phe Ser Ile Gly Val Leu Thr Ala Glu Thr Gly Ala Gly
 290 295 300
 Val Val Ala Ala Ala Ala Gly Gly Val Gly Ala Ala Thr Ala Gly Val
 305 310 315 320
 Ser Leu Leu Gln Cys Leu Val Gly Ser Lys
 325 330

<210> 38

<211> 990

<212> DNA

<213> Mycobacterium tuberculosis

<400> 38

ttgccggcca ttccgtttca aggcgaagcg cgcgcaggac ggcgtccggg tcggccacgc 60
 cgctgtccag caggcgtcgt gcgatgtcgt cctcgtcaa tgggccatgt tcggccagga 120

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ttctcgccac ggcttgggtc gcatcgaacg cttcggccac ggtggccacc ttatgccgcg      180
gccagccgag gcttgacgtc gggcaccagc cgatggggct ggcctcgcct aggggttcggc      240
gttgtgacgg cgccgacgcg gtggaccctg gccgacggac gtgagctgct gttcttttcg      300
ctgcccgggc cccgcaccag cggcaccgcc gcagaacggg tggctcgcca cgctcaagcg      360
caaacgttcg ccggcgatat ccgccagcgc gccatacagc tggtcgtgtc cgaacaagaa      420
gtggcaagca aaatcaccgc cgctaccgcc ggaatcgcca ccaccacctt cccggaaaca      480
cccagcatcg acgacaccat catcggcaac gacaaccgcg aactgggggt ccggttggtc      540
gacgtcaaac aagatggcgg cactagtccc ccgccccat ttgcgccgtg ggacaccctt      600
gatggaacac cgccgccggg cactggccta agccctacgc tgcagcagat gatcctcggc      660
ggtgatccag ctaatctgac cggccagggt cttgcggaca acgtgcaacg gttcgtacag      720
tcgctgcccg caaacgaccc caacacagcg tggttgcgcg gtcagggttg gcgatctgcag      780
gcgcacgtcg ccgatattga gtacgccgcg acccattgca gcaccaacga ctggatcgac      840
cggaccgccc agttcgctc cggcgccata gtcttcagca tcggcggtgtt gaccgcagag      900
accggggcgg gggtcgtggc tgccgcggcc ggtggtgtcg gcgcggccac ggcgggcgtg      960
agtcttctac aatgcctggt ggggagcaag                                         990

```

<210> 39

<211> 354

<212> PRT

<213> Mycobacterium tuberculosis

<400> 39

```

Met Ala Gly Asp Arg Gly Ala Asp Pro Gly Pro Ala Asn Val Thr Pro
1      5      10      15

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Gly Ala Asp Asp His Ala Gln His Ala Ser Pro Thr Val Leu Cys Pro
      20      25      30

```

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Gln Gly His Val Asn Ala Trp Asp Tyr Arg Phe Cys Glu Arg Cys Gly
      35      40      45

```

```

Ser Pro Ile Gly Val Val Pro Trp Pro Ser Glu Glu Ser Gly Thr Arg
      50      55      60

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Gln Thr Ala Pro Ala Arg Ser Phe Val Pro Leu Val Val Leu Ala Ala
65 70 75 80

Thr Leu Leu Val Val Ala Val Val Val Thr Ala Val Gly Tyr Ala Val
85 90 95

Thr Arg Pro Ala Arg Asn Asp Arg Glu Glu Pro Ser Ser Ala Arg Gly
100 105 110

Ala Ala Thr Thr Gly Val Pro Phe Ala Gln Ala Glu Ala Ala Ser Cys
115 120 125

Pro Asp Asp Pro Val Leu Glu Ala Glu Ser Ile Asp Leu Thr Ser Asp
130 135 140

Gly Leu Ala Val Ser Ala Ala Phe Met Ser Ala Cys Ala Gly Gly Asp
145 150 155 160

Val Glu Ser Asn Ser Ala Leu Glu Val Thr Val Ala Asp Gly Arg Arg
165 170 175

Asp Val Ala Ala Gly Ser Phe Asp Phe Ser Ala Asp Pro Leu Arg Ile
180 185 190

Glu Pro Gly Val Pro Ala Arg Arg Thr Leu Val Phe Pro Pro Gly Met
195 200 205

Tyr Trp Arg Thr Pro Asp Met Leu Ser Gly Ala Pro Ala Leu Ala Ala
210 215 220

Thr Arg Lys Gly Arg Ser Asp Arg Ser Ala Ala Arg Gly Gly Ser Ala
225 230 235 240

Arg Thr Thr Met Val Ala Ala Ala Ser Ala Ala Pro Ala Tyr Gly Ser
245 250 255

Ile Asn Ala Val Ala Gly Ala Val Leu Val Glu Leu Arg Asp Ser Asp
260 265 270

Phe Pro Tyr Val Arg Val Gly Ile Ala Asn Arg Trp Val Pro Gln Val
275 280 285

Ser Ser Lys Arg Val Gly Leu Val Ala Ala Gly Lys Thr Trp Thr Ser
290 295 300

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Ala Asp Ile Leu Arg Asp His Leu Ala Leu Arg Gln Arg Phe Gly Gly
305 310 315 320

Ala Arg Leu Val Trp Ser Gly His Trp Thr Thr Phe Ser Gly Pro Asp
325 330 335

Phe Trp Val Thr Val Val Gly Pro Ala Gln Pro Thr Ala Ala Glu Ala
340 345 350

Asn Arg

<210> 40

<211> 1062

<212> DNA

<213> Mycobacterium tuberculosis

<400> 40

```

atggcaggcg atcgaggcgc tgaccccggt cgggcgaatg tgactccggg tgcggatgac      60
catgcacagc atgcgtcgcc gacgggtgcta tgtcccagg gtcacgtgaa cgcattgggac      120
tacaggttct gtgagcgggtg cggctcgccg atcggcggtg tgccctggcc gtcggaggaa      180
tcaggcacac gccagacggc gccgcgcgca tccttcgtcc ccctcgtcgt cctcgcgggc      240
acgctgctcg tggtcgccgt cgtcgtgacg gccgtcggct acgcggtgac gcgaccggct      300
cgcaacgacc gtgaggagcc cagttccgcg cggggcgccg ccacgacggg tgtgccgttc      360
gcacaggccg aggccgcgag ttgccgggac gatccgggtg ttgaagcgga gtcgatcgac      420
ctgacgtccg acgggcttgc ggtgagtgcc gcgttcattg cggcatgcgc cggcggcgat      480
gtcgagtcca actcggcgct cgaggtcacc gtcgccgacg gacggcgcca cgtggcgggc      540
ggaagcttcg acttctcggc agatccgctg aggatcgagc cggcggtgcc cggccgtcca      600
accctgggtct ttccgcccgg aatgtattgg cgaacgcccg acatgttgtc cggcgacccg      660
gcattggcgg ccacacggaa gggcagggtc gatcggttcg ccgcacgagg cggatcggca      720
cggacgacca tggtcgcggc cgcgtccgcg gcaccggctt acggcagcat caacgccgtt      780
gccggggcgg tgctgggtgga gctacgtgac tcggacttcc cctacgtgcg agtcgggtatc      840
gccaatcgct gggtgccgca ggtgagttcg aagcgcgctg gcctggtcgc cgcggggaaa      900

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acgtggacga gcgccgatat tcttcgcgat cacctggccc tgcggcagcg gttcgggggc 960
 gcccgctgg tgtggtcggg gcactggacc accttcagcg gacccgattt ctgggtgacg 1020
 gtggttgggc cggcgcagcc caccgcagct gaggccaatc gc 1062

<210> 41

<211> 341

<212> PRT

<213> Mycobacterium tuberculosis

<400> 41

Met Thr Val Ser Arg Ser Ser Ser Ala Pro Ser Leu Ala Arg Arg Ala
 1 5 10 15

Arg Arg Cys Thr Gly Ser Asp Asp Ala Ala Met Ser Phe Cys Val Tyr
 20 25 30

Cys Gly Ala Glu Leu Ala Asp Pro Thr Arg Cys Gly Ala Cys Gly Ala
 35 40 45

Tyr Lys Ile Gly Ser Thr Trp His Arg Thr Thr Thr Pro Thr Val Gly
 50 55 60

Ala Ala Thr Thr Ala Thr Gly Trp Arg Pro Asp Pro Thr Gly Arg His
 65 70 75 80

Glu Gly Arg Tyr Phe Val Ala Gly Gln Pro Thr Asp Leu Val Arg Glu
 85 90 95

Gly Asp Ala Glu Ala Val Asp Pro Leu Gly Gln Gln Gln Leu Asp Gln
 100 105 110

Ser Gly Ala Val Gly Val Ser Pro Ser Ala Val Ser Gly Trp Val Arg
 115 120 125

Ser Gly His Arg Arg Leu Trp Trp Ala Leu Ala Gly Val Val Ala Phe
 130 135 140

Leu Gly Leu Val Gly Ala Gly Val Val Gly Thr Leu Phe Leu Asn Arg
 145 150 155 160

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Asp Arg Glu Ser Ile Asp Asp Lys Tyr Leu Ala Ala Leu Arg Arg Ser
 165 170 175

Gly Leu Thr Gly Glu Phe Asn Ser Asp Ala Asn Ala Ile Ala Arg Gly
 180 185 190

Lys Gln Val Cys Arg Gln Leu Gln Asp Gly Gly Glu Gln Gln Gly Met
 195 200 205

Pro Val Asp Gln Val Ala Val Gln Tyr Tyr Cys Pro Gln Phe Ser Asp
 210 215 220

Gly Phe His Ile Leu Glu Thr Ile Thr Val Thr Gly Ser Phe Thr Leu
 225 230 235 240

Lys Asp Glu Ser Pro Asn Val Tyr Ala Pro Ala Ile Thr Val Ser Gly
 245 250 255

Ser Gly Cys Ser Gly Ser Ala Gly Tyr Ala Asp Ile Asp Arg Gly Thr
 260 265 270

Gln Val Thr Val Lys Asn Gly Gln Gly Asp Ile Leu Ala Thr Ala Phe
 275 280 285

Leu Gln Ala Gly Gln Gly Gly Arg Phe Leu Cys Thr Phe Pro Phe Ser
 290 295 300

Phe Glu Ile Thr Glu Gly Glu Asp Arg Tyr Val Val Ser Val Ser Arg
 305 310 315 320

Arg Gly Glu Met Ser Tyr Ser Phe Ala Asp Leu Lys Ala Asn Gly Leu
 325 330 335

Ser Leu Val Leu Gly
 340

<210> 42

<211> 1023

<212> DNA

<213> Mycobacterium tuberculosis

-53-

<400> 42
 atgactgttt cgcaagttc atcagcaccc tcgttggcgc gaagggcacg acggtgtacc 60
 ggaagtgacg acgctgccat gagtttctgc gtgtattgcg gtgccgagct tgccgacccg 120
 accaggtgcg gggcgtgcgg cgcatacaag attggttcaa cctggcatcg gaccacgacg 180
 ccgacggtcg gcgccgcgac gacggcaacg ggatggcgac ccgatccac cggtcgccac 240
 gagggacgct acttcgtcgc cgggcagccg accgacctcg ttcgcgaggg cgacgccgaa 300
 gccgttgacc cacttggta gcagcagctg gatcagtcag gtgccgttg tggttgcgcg 360
 tcagcgggtg cggggtgggt gcgttctggg caccgtcgac tgtggtgggc gcttgcgggc 420
 gtggtggcgt ttctcgggct ggtgggagcc ggtgtcgtcg ggacgctgtt cctgaatcga 480
 gaccgggagt ccatcgacga caagtacctc gccgccttga ggcgggtccg actcaccggt 540
 gagttcaact ccgacgcgaa cgccatcgcc cgcggcaagc aggtgtgccg ccagttgcaa 600
 gacggtggcg aacagcaggg gatgccggtc gatcaggtcg ccgtgcaata ctactgcccg 660
 cagttcagcg atggcttcca taccctggaa accataactg tcaactggaag tttcacctc 720
 aaggatgaat cgccaaacgt gtacgcaccg gcgatcaccg tgcgggctc cgggtgctca 780
 gggtcagccg gctacgccga catcgaccgg ggaacgcagg tgacggtgaa aaacggtcag 840
 ggggacatcc tggccacggc cttcctgcag gcgggtcagg gcggccgatt cttgtgcacc 900
 ttccctttct cgtttgaaat caccgagggc gaagaccgct acgtcgtgtc ggtcagtcgt 960
 cgaggcgaaa tgagttactc gttcgccgat ctgaaggcca atgggctatc gtcgtcttg 1020
 ggc 1023

<210> 43

<211> 479

<212> PRT

<213> Mycobacterium tuberculosis

<400> 43

Val Thr Ala Ala Val Arg His Ser Asp Val Leu Val Val Gly Ala Gly
 1 5 10 15

Ser Ala Gly Ser Val Val Ala Glu Arg Leu Ser Met Asp Ser Ser Cys
 20 25 30

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Val Val Thr Val Leu Glu Ala Gly Pro Gly Leu Ala Asp Pro Gly Leu
 35 40 45

Leu Ala Gln Thr Ala Asn Gly Leu Gln Leu Pro Ile Gly Ala Gly Ser
 50 55 60

Pro Leu Val Glu Arg Tyr Arg Thr Arg Leu Thr Asp Arg Pro Val Arg
 65 70 75 80

His Leu Pro Ile Val Arg Gly Ala Thr Val Gly Gly Ser Gly Ala Ile
 85 90 95

Asn Gly Gly Tyr Phe Cys Arg Gly Leu Pro Ser Asp Phe Asp Arg Ala
 100 105 110

Ser Ile Pro Gly Trp Ala Trp Ser Asp Val Leu Glu His Phe Arg Ala
 115 120 125

Ile Glu Thr Asp Leu Asp Phe Glu Thr Pro Val His Gly Arg Ser Gly
 130 135 140

Pro Ile Pro Val Arg Arg Thr His Glu Met Thr Gly Ile Thr Glu Ser
 145 150 155 160

Phe Met Ala Ala Ala Glu Asp Ala Gly Phe Ala Trp Ile Ala Asp Leu
 165 170 175

Asn Asp Val Gly Pro Glu Met Pro Ser Gly Val Gly Ala Val Pro Leu
 180 185 190

Asn Ile Val Asn Gly Val Arg Thr Ser Ser Ala Val Gly Tyr Leu Met
 195 200 205

Pro Ala Leu Gly Arg Pro Asn Leu Thr Leu Leu Ala Arg Thr Arg Ala
 210 215 220

Val Arg Leu Arg Phe Ser Ala Thr Thr Ala Val Gly Val Asp Ala Ile
 225 230 235 240

Gly Pro Gly Gly Pro Val Ser Leu Ser Ala Asp Arg Ile Val Leu Cys
 245 250 255

Ala Gly Ala Ile Gln Ser Ala His Leu Leu Met Leu Ser Gly Val Gly
 260 265 270

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Glu Glu Glu Val Leu Arg Ser Ala Gly Val Lys Val Leu Met Ala Leu
 275 280 285

Pro Val Gly Met Gly Cys Ser Asp His Pro Glu Trp Val Met Pro Thr
 290 295 300

Asn Trp Ala Val Ala Val Asp Arg Pro Val Leu Glu Val Leu Leu Ser
 305 310 315 320

Thr His Asp Gly Ile Glu Ile Arg Pro Tyr Thr Gly Gly Phe Val Ala
 325 330 335

Met Thr Gly Asp Gly Thr Ala Gly His Arg Asp Trp Pro His Ile Gly
 340 345 350

Val Ala Leu Met Gln Pro Arg Ala Arg Gly Arg Ile Thr Leu Val Ser
 355 360 365

Ser Asp Pro Gln Ile Pro Val Arg Ile Glu His Arg Tyr Asp Ser Glu
 370 375 380

Pro Ala Asp Val Ala Ala Leu Arg Gln Gly Ser Ala Leu Ala His Glu
 385 390 395 400

Leu Cys Gly Ala Ala Thr Arg Ile Gly Pro Ala Val Trp Ala Thr Ser
 405 410 415

Gln His Leu Cys Gly Ser Ala Pro Met Gly Thr Asp Asp Asp Pro Arg
 420 425 430

Ala Val Val Asp Pro Arg Cys Arg Val Arg Gly Ile Glu Asn Leu Trp
 435 440 445

Val Ile Asp Gly Ser Val Leu Pro Ser Ile Thr Ser Arg Gly Pro His
 450 455 460

Ala Thr Ile Val Met Leu Gly His Arg Ala Ala Glu Phe Val Gln
 465 470 475

<210> 44

<211> 1437

<212> DNA

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<213> *Mycobacterium tuberculosis*

<400> 44

```

gtgactgcgg cggctccggca tagcgatgtg ctggtcgtcg gtgctggaag tgctggatcg      60
gttgttgccg agcgtctttc catggactcg agctgtgtgg tgaccgtgct tgaggctggc      120
cccgggctgg ccgatccggg gttgctggct cagacggcca atgggttgca actgccgac      180
ggagctggca gccctctggt tgagcggttat cggacgcggc tcaccgatcg accggttcgc      240
cacttgccga tcgtgcgggg tgcgacggtc ggcggttccg gcgcaatcaa cggcggctat      300
ttctgcccg gactgcccag cgatttcgac cgtgcctcga taccaggctg ggcatggtct      360
gacgttctgg agcacttccg ggctatcgag acagatctgg atttcgagac gcctgtgcat      420
ggccgtagtg gccccatccc agttcgccgc acacacgaaa tgactggcat cactgaaagt      480
ttcatggctg ccgcagagga cgcagggttc gcttggatcg ctgacctcaa cgatgttggg      540
ccggaaaatgc cttcgggtgt aggcgcggtc ccgctcaaca tcgttaacgg cgtacgcacc      600
agctcgggcg tcggctatct gatccccgcg ctgggacggc cgaatctgac actgctggcc      660
cggacgcggg cggtgcggtt gcgcttttcc gccaccaccg cggtggggtg cgacgcgac      720
ggcccaggag gcccggtaag cctgagcgct gaccgaatcg tattgtgcgc cggagcgatt      780
cagtcagctc atctgttgat gctctcgggc gtcggcgagg aggaggtgtt gcgatccgcc      840
ggtgtgaagg tgcttatggc gttgccggtt ggcatgggct gcagtgacca cccggaatgg      900
gtgatgccga ccaactgggc ggtggctgtc gatcggccgg tgtagaggt gctgctgagc      960
actcatgacg gcatcgaaat aaggccgtac acaggcggct tcgttgcgat gaccggcgac     1020
ggtacagccg ggcatcgca ttggccgcat atcgggggtg cgctcatgca gccgcgggca     1080
cgcggacgca tcacgttggc ctcgagtgat cccagatac cagtccgcat cgagcaccga     1140
tacgacagtg aacctgccga tgtcgcggcc ctgcgccagg gtagcgcatt ggcccacgaa     1200
ttatgcggtg cggcaacgcg catcggcca gccgatggg cgacatcgca gcatctgtgt     1260
ggtagtgccc caatgggcac cgacgatgac ccacgagccg tcgtcgacce gaggtgtcgg     1320
gtccgcggca tcgaaaacct atgggtgata gacggatctg tccttcgctc gatcaccagt     1380
cgcgggtccac acgcaacgat cgtaatgctg ggccaccgcg cggccgaatt tgttcag      1437

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<210> 45

<211> 203

-57-

<212> PRT

<213> Mycobacterium tuberculosis

<400> 45

Leu Gly Arg Arg Gly Asn Arg Arg Val His Val Asp Arg Val Arg Leu
 1 5 10 15

Thr Gly Thr Glu Arg Glu Leu Arg Ala Glu Asn Gln Ser Pro Pro Ile
 20 25 30

Phe Arg Pro Gln Asn Thr Leu Gly Asp Gly Ala Asn Gly Leu Pro Leu
 35 40 45

Ala Val Cys Thr Thr Thr Ala His Thr Cys His Thr Ser His Thr His
 50 55 60

Pro Ser Arg Trp Thr Pro Asn Pro Val Pro Ala Thr Lys Gly Val Pro
 65 70 75 80

Ala Gly Leu Val Gln Ala Thr Phe Ile Ile Glu Asn Leu Asp Pro Gly
 85 90 95

Asn Asn Asp Thr Pro Thr Pro Pro Thr Pro Lys Leu Arg Leu Ala Arg
 100 105 110

Lys Pro Gly His His Arg Arg Ser Glu Tyr Asp Ala Asp Ser Val Leu
 115 120 125

Arg Arg Lys Asp Thr Ser Arg Arg Cys Val Gln Ala Asp Asp Val Arg
 130 135 140

Cys Val Gln Leu Val Gln Asp Pro Arg Arg Gly Arg Val Glu Leu Gly
 145 150 155 160

Gly Tyr Arg Ala Glu Leu Thr Val Gly Arg Arg Ala Ala Val Asn Cys
 165 170 175

Gln Arg Pro Gln Tyr Gly Ala Asp Gly Trp Pro Val Arg Leu Gly Cys
 180 185 190

Gly Val Gly Gly Ala Ala Arg Gly Asp Gln Arg
 195 200

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<210> 46

<211> 609

<212> DNA

<213> Mycobacterium tuberculosis

<400> 46

```

ttgggtcgca ggggtaaccg aaggggtgcac gttgaccgcg tgaggctaac cggcaccgag      60
cgtgaactga gggcggagaa tcagagcccc ccgattttcc gcccgagaa cacgttgggc      120
gacggcgcca acgggctgcc actggccgtg tgcaccacga cggtcacac gtgccacact      180
tcccatactc acccatcgcg gtggacccca aaccagtgcc cggccaccaa gggcgtcccc      240
gctggattgg tgcaagcaac cttcatcatc gaaaaccttg accccggcaa caacgacacg      300
ccgaccccc ctacacccaa actgcgatta gcccgaaaac ctgggcacca taggcgatct      360
gaatacgatg cggattcggt gctgcggaga aaggatacat cgcgccgatg cgtccaggcg      420
gatgacgtcc gatgcgtgca gctggtccag gatccgcggc gcggacgtgt cgaactcggc      480
ggttaccgcg ccgagcttac tgttggccga cgggcggcgg tgaattgcca acgcccgcaa      540
tatggtgcgg atggatggcc cgttcggttg ggttgcgggg taggcggcgc cgcgcgaggc      600
gatcagcgc                                     609

```

<210> 47

<211> 250

<212> PRT

<213> Mycobacterium tuberculosis

<400> 47

```

Met Thr Met Pro Leu Arg Gly Leu Gly Pro Pro Asp Asp Thr Gly Val
1           5           10           15

Arg Glu Val Ser Thr Gly Asp Asp His His Tyr Ala Met Trp Asp Ala
          20           25           30

Ala Tyr Val Leu Gly Ala Leu Ser Ala Ala Asp Arg Arg Glu Phe Glu
          35           40           45

```

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Ala His Leu Ala Gly Cys Pro Glu Cys Arg Gly Ala Val Thr Glu Leu
 50 55 60

Cys Gly Val Pro Ala Leu Leu Ser Gln Leu Asp Arg Asp Glu Val Ala
 65 70 75 80

Ala Ile Ser Glu Ser Ala Pro Thr Val Val Ala Ser Gly Leu Ser Pro
 85 90 95

Glu Leu Leu Pro Ser Leu Leu Ala Ala Val His Arg Arg Arg Arg Arg
 100 105 110

Thr Arg Leu Ile Thr Trp Val Ala Ser Ser Ala Ala Ala Val Leu
 115 120 125

Ala Ile Gly Val Leu Val Gly Val Gln Gly His Ser Ala Ala Pro Gln
 130 135 140

Arg Ala Ala Val Ser Ala Leu Pro Met Ala Gln Val Gly Thr Gln Leu
 145 150 155 160

Leu Ala Ser Thr Val Ser Ile Ser Gly Glu Pro Trp Gly Thr Phe Ile
 165 170 175

Asn Leu Arg Cys Val Cys Leu Ala Pro Pro Tyr Ala Ser His Asp Thr
 180 185 190

Leu Ala Met Val Val Val Gly Arg Asp Gly Ser Gln Thr Arg Leu Ala
 195 200 205

Thr Trp Leu Ala Glu Pro Gly His Thr Ala Thr Pro Ala Gly Ser Ile
 210 215 220

Ser Thr Pro Val Asp Gln Ile Ala Ala Val Gln Val Val Ala Ala Asp
 225 230 235 240

Thr Gly Gln Val Leu Leu Gln Arg Ser Leu
 245 250

<210> 48

<211> 750

<212> DNA

-60-

<213> Mycobacterium tuberculosis

<400> 48

```

atgacgatgc cgctacgagg acttggtccc cccgatgaca ccggtgtgcg cgaggtgtcg      60
acgggtgatg atcaccacta cgcgatgtgg gatgcagctt acgtgttggg agcattgtct      120
gcggccgacc gccgcgaatt cgaagcgcac ctggccggtt gccccgaatg ccggggggcc      180
gtcaccgaac tctgcggggt gcccgccctg ctgtcccagc tcgatcgtga cgaagtggcc      240
gcgattagcg aatccgcccc gactgtggtg gcttcggggc tgtcgccgga gttgttgccg      300
tcgttgctgg cggcgggtgca caggcgtcgg cgccgtaccc ggctgatcac ctgggtggcc      360
tcgtccgccc ctgccgcggt gctggcgatc ggtgtgctag tcggtgtgca gggccactcc      420
gcggcaccgc agcgggcggc cgtgtcggcg ctgccgatgg ccaggtcgg cacgcagctg      480
ttggcgcca cgggtgtgat cagcggcgag ccttggggga cgttcatcaa cctgcggtgc      540
gtctgcctgg cgccgccgta tgcttccac gacacgctgg ccatggttgt ggtgggtcgt      600
gacggcagcc agacacggct ggcgacttgg ttggccgaac ccggtcacac cgcgacaccc      660
gccggcagca ttctgacacc ggttgaccag atcgccgccg tgcaagtggg tgccgccgat      720
accggccagg ttctgctgca gcgttcgctc                                     750

```

<210> 49

<211> 294

<212> PRT

<213> Mycobacterium tuberculosis

<400> 49

```

Met Thr Thr Ile Ala Phe Leu Gly Leu Gly Asn Met Gly Ala Pro Met
1           5           10           15

Ser Ala Asn Leu Val Gly Ala Gly His Val Val Arg Gly Phe Asp Pro
          20           25           30

Ala Pro Thr Ala Ala Ser Gly Ala Ala Ala His Gly Val Ala Val Phe
          35           40           45

Arg Ser Ala Pro Glu Ala Val Ala Glu Ala Asp Val Val Ile Thr Met
          50           55           60

```

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Leu Pro Thr Gly Glu Val Val Arg Arg Cys Tyr Thr Asp Val Leu Ala
 65 70 75 80

Ala Ala Arg Pro Ala Thr Leu Phe Ile Asp Ser Ser Thr Ile Ser Val
 85 90 95

Thr Asp Ala Arg Glu Val His Ala Leu Ala Glu Ser His Gly Met Leu
 100 105 110

Gln Leu Asp Ala Pro Val Ser Gly Gly Val Lys Gly Ala Ala Ala Ala
 115 120 125

Thr Leu Ala Phe Met Val Gly Gly Asp Glu Ser Thr Leu Arg Arg Ala
 130 135 140

Arg Pro Val Leu Glu Pro Met Ala Gly Lys Ile Ile His Cys Gly Ala
 145 150 155 160

Ala Gly Ala Gly Gln Ala Ala Lys Val Cys Asn Asn Met Val Leu Ala
 165 170 175

Val Gln Gln Ile Ala Ile Ala Glu Ala Phe Val Leu Ala Glu Lys Leu
 180 185 190

Gly Leu Ser Ala Gln Ser Leu Phe Asp Val Ile Thr Gly Ala Thr Gly
 195 200 205

Asn Cys Trp Ala Val His Thr Asn Cys Pro Val Pro Gly Pro Val Pro
 210 215 220

Thr Ser Pro Ala Asn Asn Asp Phe Lys Pro Gly Phe Ser Thr Ala Leu
 225 230 235 240

Met Asn Lys Asp Leu Gly Leu Ala Met Asp Ala Val Ala Ala Thr Gly
 245 250 255

Ala Thr Ala Pro Leu Gly Ser His Ala Ala Asp Ile Tyr Ala Lys Phe
 260 265 270

Ala Ala Asp His Ala Asp Leu Asp Phe Ser Ala Val Ile His Thr Leu
 275 280 285

Arg Ala Arg Ala Asp Ala

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290

<210> 50

<211> 882

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 50

```

atgacgacca tcgccttcct aggtttgggc aacatgggtg cgccgatgtc ggccaatctg      60
gttgggtgcgg gccacgtcgt gcgtggattc gacccggcac ccacggcggc gtccggcgcc      120
gccgcgcacg gtgtcgcggt gtttcgtagc gcgcccgaag cggtggccga ggccgacgtg      180
gtcatcacca tgctgccac cggcgaggtg gtccggcgct gctacaccga cgtgctggcc      240
gccgcgcgtc cggaacgct gttcatcgac agctccacga tctcggtcac cgatgcccgt      300
gaggtgcacg cgtgggccga atcgacggc atgtccaac tggatgcgcc ggtctccggc      360
ggggtgaagg gcgcgcgcgc cgcgacgctg gcattcatgg tcggcgccga cgagtccacg      420
ctacggcggg cacgcccggg actagagccc atggcgggca agatcattca ctgcggcgcc      480
gccggtgccg gacaggccgc caaggtgtgc aacaacatgg tgctggcggt gcagcagatc      540
gcgatcgccg aggcgttcgt gctggccgag aagctcgggc tgtccgcaca atcgttgttc      600
gacgtcatca ccggcgcgac cggcaattgc tgggcggtgc acaccaattg cccggtgccg      660
ggcccgggtg ccacctcacc ggccaacaac gacttcaagc ccgggttttc gaccgcgttg      720
atgaacaagg acctgggcct ggcgatggat gcggtggccg ccaccggtgc gacggccccg      780
ctgggcagcc acgccgccga catctacgcc aaattcgccg ccgaccacgc cgacctggac      840
ttcagcgcgg tgatccacac gttgcgcgcg cgagcagacg ca                        882

```

<210> 51

<211> 207

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 51

Met Gly Val Thr Ala Ala Val Thr Pro Lys Gly Glu Arg Arg Arg Tyr

-63-

1	5	10	15
Ala Leu Val	Ser Ala Ala Ala	Glu Leu Leu Gly	Glu Gly Gly Phe Glu
	20	25	30
Ala Val Arg	His Arg Ala Val	Ala Arg Arg Ala Gly	Leu Pro Leu Ala
	35	40	45
Ser Thr Thr	Tyr Tyr Phe Ser Ser	Leu Asp Asp Leu Ile	Ala Arg Ala
	50	55	60
Val Glu His	Ile Gly Met Ile Glu	Val Ala Gln Leu Arg	Ala Arg Val
	65	70	75 80
Ser Ala Leu	Ser Arg Arg Arg Arg	Gly Pro Glu Thr Thr	Ala Val Val
	85	90	95
Leu Val Asp	Leu Leu Val Gly Glu	Met Ser Ser Pro Gly	Leu Ala Glu
	100	105	110
Gln Leu Ile	Ser Arg Tyr Glu Arg	His Ile Ala Cys Thr	Arg Leu Pro
	115	120	125
Asp Leu Arg	Glu Ser Met Arg Arg	Ser Leu Arg Gln Arg	Ala Glu Ala
	130	135	140
Val Ala Glu	Ala Ile Glu Arg Ser	Gly Arg Ser Ala Gln	Ile Glu Leu
	145	150	155 160
Val Cys Thr	Leu Ile Cys Ala Val	Asp Gly Ser Val Val	Ser Ala Leu
	165	170	175
Val Glu Gly	Arg Asp Pro Arg Ala	Ala Ala Leu Ala Thr	Val Val Asp
	180	185	190
Leu Ile Asp	Val Leu Ala Pro Val	Asp Gln Arg Pro Val	Pro Phe
	195	200	205

<210> 52

<211> 621

<212> DNA

<213> Mycobacterium tuberculosis

-64-

<400> 52
 atgggctga cagcagcgg cactccaaaa ggagaacgtc ggcggtatgc gttggtcagc 60
 gccgccgcgg agctgctcgg cgagggcggg ttcgaggcgg tacgccaccg ggcggtggcg 120
 cggcggggccg gtttgccgtt ggcgctctacc acctactact tctcgctcgt cgacgatttg 180
 atcgctcgcg cggtcgaaca catcggaatg atcgaggtgg ctgagctgcg agcccgggtc 240
 agtgcgctgt cccggcgacg tcggggggccc gagaccaccg ccgttggtgt ggttgacctg 300
 ctggtggggg aaatgtccag tccggggctt gccgagcagc tgatctcacg atacgagcgc 360
 catatgcct gtaccgcct gcctgacctg cgcgaaagca tgcgccgcag cctgcgctcag 420
 cgcgctgagg ccgtggccga ggccatcgag cgtccggcc gctccgcaca gatcgaactg 480
 gtgtgtacgt tgatctgtgc ggtcgacgga tcggtggtct cggcgctggt cgaagggcgg 540
 gaccgcgtg ccgctgcgct ggcgacggtg gtcgacctca tcgacgtgct cgcgcccgtc 600
 gaccagcgtc cggtgccgtt c 621

<210> 53

<211> 259

<212> PRT

<213> Mycobacterium tuberculosis

<400> 53

Met Tyr Phe Val Gly Val Asp Leu Ala Trp Ala Gly Arg Asn Pro Thr
 1 5 10 15

Gly Val Ala Ala Val Asp Ala Asp Gly Cys Leu Val Gly Val Gly Ala
 20 25 30

Ala Arg Asp Asp Ala Ser Val Leu Ala Ala Leu Arg Pro Tyr Val Val
 35 40 45

Gly Asp Cys Leu Val Ala Phe Asp Ala Pro Leu Val Val Ala Asn Arg
 50 55 60

Thr Gly Gln Arg Pro Ala Glu Ala Ala Leu Asn Arg Asp Phe Arg Gln
 65 70 75 80

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Phe Glu Ala Gly Ala Tyr Pro Ala Asn Thr Glu Lys Pro Glu Phe Ala
 85 90 95

Asp Val Pro Arg Ala Ala Arg Leu Ala Arg Gln Leu Ala Leu Asp Met
 100 105 110

Asp Pro Leu Ser Ser Ala Thr Arg Arg Ala Ile Glu Val Tyr Pro His
 115 120 125

Pro Ala Thr Val Ala Leu Phe Arg Leu Pro Arg Ala Leu Lys Tyr Lys
 130 135 140

Ala Lys Pro Gly Arg Ser Val Asp Leu Leu Lys Ser Glu Leu Leu Arg
 145 150 155 160

Leu Met Asp Gly Val Glu Gly Leu Ala Gln Ala Gly Val Arg Met Gln
 165 170 175

Val Ala Gly Gln Pro Asp Trp Val Ser Leu Arg Arg Gln Val Thr Val
 180 185 190

Ala Gln Arg Lys Ser Asp Leu Arg Ala Ala Glu Asp Pro Ile Asp Ala
 195 200 205

Val Val Cys Ala Tyr Val Ala Leu Tyr Ala Gln Arg Arg Pro Ala Asp
 210 215 220

Val Thr Ile Tyr Gly Asp Phe Thr Thr Gly Tyr Ile Val Thr Pro Ser
 225 230 235 240

Leu Pro Thr Asp Phe Arg Thr Ala Pro Asp Ala Gly Arg Arg Ala Arg
 245 250 255

Ala Arg Arg

<210> 54

<211> 777

<212> DNA

<213> Mycobacterium tuberculosis

-66-

<400> 54
 atgtacttcg tcggcgtgga cctcgccctgg gccggccgca atccgaccgg tgtcgcggt 60
 gtcgacgcgg acgggtgtct ggtgggggtc ggtgccgctc gcgacgatgc ctccgtgctg 120
 gcggcgctgc ggccctacgt tgtgggcgat tgcctggctc ccttcgacgc gccgctggtg 180
 gtggccaacc gcaccggcca gcggccggcg gaggccgcac tgaatcgaga cttccgacaa 240
 ttcgaggccg gcgcgtatcc ggccaacacc gaaaagcccg agtttgccga cgttcacgc 300
 gccgcccggc tggcccgcca actggcgctg gatatggatc ctctttcgtc cgccacgcgg 360
 cgggccatcg aggtctatcc gcacccggct acggtggcgc tgtttcggct accccgcgcg 420
 ctgaagtaca aggccaagcc gggacgcagc gttgacctgc tcaaatacga gctattgcga 480
 ctgatggacg gcgtcgaggg gctcgcccag gccgggggtc ggatgcaggt agccggtcag 540
 ccggattggg tctcgttgcg ccggcaggtg acggtcgcg agcgaaaaag cgacctgcgg 600
 gccgccgagg atccgatcga cgccgtcgta tgcgcctacg tggcgttgta cgcccaacgc 660
 cggcccgcgg atgtcacgat ctatggggac ttcaccaccg ggtacattgt cacgccgtcg 720
 ctgcccaccg acttcagaac ggcaccggac gctggtcgac gggcgcgagc acgtcga 777

<210> 55

<211> 566

<212> PRT

<213> Mycobacterium tuberculosis

<400> 55

Val Ala Leu Thr Cys Thr Asp Met Ser Asp Ala Val Ala Gly Ser Asp
 1 5 10 15

Ala Glu Gly Leu Thr Ala Asp Ala Ile Val Val Gly Ala Gly Leu Ala
 20 25 30

Gly Leu Val Ala Ala Cys Glu Leu Ala Asp Arg Gly Leu Arg Val Leu
 35 40 45

Ile Leu Asp Gln Glu Asn Arg Ala Asn Val Gly Gly Gln Ala Phe Trp
 50 55 60

Ser Phe Gly Gly Leu Phe Leu Val Asn Ser Pro Glu Gln Arg Arg Leu
 65 70 75 80

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Gly Ile Arg Asp Ser His Glu Leu Ala Leu Gln Asp Trp Leu Gly Thr
 85 90 95

Ala Ala Phe Asp Arg Pro Glu Asp Tyr Trp Pro Glu Gln Trp Ala His
 100 105 110

Ala Tyr Val Asp Phe Ala Ala Gly Glu Lys Arg Ser Trp Leu Arg Ala
 115 120 125

Arg Gly Leu Lys Ile Phe Pro Leu Val Gly Trp Ala Glu Arg Gly Gly
 130 135 140

Tyr Asp Ala Gln Gly His Gly Asn Ser Val Pro Arg Phe His Ile Thr
 145 150 155 160

Trp Gly Thr Gly Pro Ala Leu Val Asp Ile Phe Val Arg Gln Leu Arg
 165 170 175

Asp Arg Pro Thr Val Arg Phe Ala His Arg His Gln Val Asp Lys Leu
 180 185 190

Ile Val Glu Gly Asn Ala Val Thr Gly Val Arg Gly Thr Val Leu Glu
 195 200 205

Pro Ser Asp Glu Pro Arg Gly Ala Pro Ser Ser Arg Lys Ser Val Gly
 210 215 220

Lys Phe Glu Phe Arg Ala Ser Ala Val Ile Val Ala Ser Gly Gly Ile
 225 230 235 240

Gly Gly Asn His Glu Leu Val Arg Lys Asn Trp Pro Arg Arg Met Gly
 245 250 255

Arg Ile Pro Lys Gln Leu Leu Ser Gly Val Pro Ala His Val Asp Gly
 260 265 270

Arg Met Ile Gly Ile Ala Gln Lys Ala Gly Ala Ala Val Ile Asn Pro
 275 280 285

Asp Arg Met Trp His Tyr Thr Glu Gly Ile Thr Asn Tyr Asp Pro Ile
 290 295 300

Trp Pro Arg His Gly Ile Arg Ile Ile Pro Gly Pro Ser Ser Leu Trp

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305		310		315		320
Leu Asp Ala Ala Gly Lys Arg Leu Pro Val Pro Leu Phe Pro Gly Phe						
	325		330		335	
Asp Thr Leu Gly Thr Leu Glu Tyr Ile Thr Lys Ser Gly His Asp Tyr						
	340		345		350	
Thr Trp Phe Val Leu Asn Ala Lys Ile Ile Glu Lys Glu Phe Ala Leu						
	355		360		365	
Ser Gly Gln Glu Gln Asn Pro Asp Leu Thr Gly Arg Arg Leu Gly Gln						
	370		375		380	
Leu Leu Arg Ser Arg Ala His Ala Gly Pro Pro Gly Pro Val Gln Ala						
	385		390		395	400
Phe Ile Asp Arg Gly Val Asp Cys Val His Ala Asn Ser Leu Arg Glu						
	405		410		415	
Leu Val Ala Ala Met Asn Glu Leu Pro Asp Val Val Pro Leu Asp Tyr						
	420		425		430	
Glu Thr Val Ala Ala Ala Val Thr Ala Arg Asp Arg Glu Val Val Asn						
	435		440		445	
Lys Tyr Ser Lys Asp Gly Gln Ile Thr Ala Ile Arg Ala Ala Arg Arg						
	450		455		460	
Tyr Arg Gly Asp Arg Phe Gly Arg Val Val Ala Pro His Arg Leu Thr						
	465		470		475	480
Asp Pro Lys Ala Gly Pro Leu Ile Ala Val Lys Leu His Ile Leu Thr						
	485		490		495	
Arg Lys Thr Leu Gly Gly Ile Glu Thr Asp Leu Asp Ala Arg Val Leu						
	500		505		510	
Lys Ala Asp Gly Thr Pro Leu Ala Gly Leu Tyr Ala Ala Gly Glu Val						
	515		520		525	
Ala Gly Phe Gly Gly Gly Gly Val His Gly Tyr Arg Ala Leu Glu Gly						
	530		535		540	

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Thr Phe Leu Gly Gly Cys Ile Phe Ser Gly Arg Ala Ala Gly Arg Gly
 545 550 555 560

Ala Ala Glu Asp Ile Arg
 565

<210> 56

<211> 1698

<212> DNA

<213> .Mycobacterium tuberculosis

<400> 56

```

gtggcgtaa cctgtaccga catgagcgat gctgtagccg gttcagatgc cgaggggctc      60
accgctgatg ccattgtcgt gggagccgga ttagcgggcc tggtagccgc ttgtgagttg      120
gccgaccgcg gcctacgggt gctgatactc gaccaggaga atcgggccaa cgtgggcggg      180
caggccttct ggtcgttcgg cggtttgttc ttggtcaaca gtcccagaca gcgccgcttg      240
ggcatccgtg atagccatga gcttgctctg caggattggc tggggacggc ggcgttcgac      300
cggcccgagg actactggcc cgaacaatgg gcgcatgctt acgtcgattt cgcggcgggg      360
gagaagcgca gctggctgcg ggcccgcggg ctgaagatct ttccgctggg gggctgggcc      420
gagcgtgggt gttacgacgc gcaggggcac ggcaactcgg tgcgccgttt ccacatcacc      480
tggggtactg ggccggctct ggtcgacata ttctgctgct agctgctgta tcgccccacg      540
gtgcgctttg cgcaccgcca ccaggctgac aaactgatcg tcgagggtaa cgcggtgaca      600
ggcgttcggg gtaccgtgct ggagccctcg gatgagccgc gcggcgcgcc ttctgctcga      660
aagtctgtgg ggaaattcga gtttcgcgcg tcagcgggtga tcgtcgccag tgggtggtatc      720
ggtggcaatc atgagctggg gcgcaaaaac tggccgagac ggatgggccc cattcccaag      780
caactgttga gcgggggtgcc cgcgcacggt gatggcagga tgatcggcat cgctcaaaag      840
gccggggctg cggtgatcaa tccggaccgg atgtggcatt acaccgaagg cattaccaac      900
tacgaccoga tctggccgcg gcacggatat cggattattc cggggccgtc gtcgctatgg      960
ctggatgccg cgggcaagcg gttgccggta ccgttgtttc cggggttcga caccctcggc     1020
acattggagt acatcaccaa gtctggacat gactacacct ggttcgtggt gaatgccaaag     1080
ataatcgaga aggaattcgc gctgtccggg caggagcaga accctgactt gaccggtcgg      1140
cgctggggcc agctgttgcg ctctcgggct caccgggcc cgcccggaac ggtgcaggca     1200

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-70-

```

ttcatcgatc gtggtgtgga ctgcgtccac gccaactcgt tgcgcgagtt ggtggccgcg 1260
atgaacgagt tgcccgatgt ggtgccgctg gactacgaga cggaggcagc cgcggtcact 1320
gcgcgcgacg gtgaggtggt caataagtac agcaaggatg gacagatcac cgcgattcgt 1380
gccgctcgcc gctaccgagg cgaccgattt ggccgggtgg tggcgccaca tcggttgacc 1440
gatccgaagg ccggggccgct gatcgcggtc aagctgcaca tcctgactcg aaagacgttg 1500
ggtggcatcg aaactgactt agatgctcgg gtgctcaagg ccgacggtac gccactggcc 1560
gggttgatatg cagccggcga ggctcgccggg ttcggcgggg gcggtgtcca tggctaccgg 1620
gccttgaggg gcaccttcct ggggtggatgc atattttccg gccgcgctgc cggccgcggg 1680
gccgccgagg atatccgc 1698

```

<210> 57

<211> 242

<212> PRT

<213> Mycobacterium tuberculosis

<400> 57

```

Met Thr Leu Ala Asn Asn Gly Thr Gly Met Asp His Phe Leu Thr Pro
1          5          10          15

```

```

Thr Glu Tyr Leu Asp Ala Gly His Pro Leu Val Arg Thr Thr Ala Ala
20          25          30

```

```

Thr Leu Ile Arg Asp Ala Val Ser Asp Thr Glu Arg Val Arg Arg Ile
35          40          45

```

```

Tyr Tyr Tyr Val Arg Asp Val Pro Tyr Asp Val Leu Ala Ser Phe Arg
50          55          60

```

```

Tyr Leu Ala Gln Gly His His Arg Ala Ser Asp Val Ile Gly His Gly
65          70          75          80

```

```

Val Ala Phe Cys Met Gly Lys Ala Ser Ser Phe Val Ala Leu Cys Arg
85          90          95

```

```

Ala Ala Gly Val Pro Ala Arg Ile Ala Phe Gln Thr Ile Asp Ala Pro
100          105          110

```

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Asp Lys Glu Phe Leu Ser Pro Gln Val Arg Ala Leu Trp Gly Gly Arg
 115 120 125

Thr Gly Arg Pro Phe Pro Trp His Ser Leu Gly Glu Ala Tyr Leu Gly
 130 135 140

Arg Arg Trp Val Lys Leu Asp Ala Thr Ile Asp Ala Pro Thr Ala Ala
 145 150 155 160

Arg Leu Gly Lys Pro Tyr Arg Gln Glu Phe Asp Gly Ala Thr Pro Ile
 165 170 175

Pro Thr Val Glu Gly Thr Ile Leu Arg Glu Asn Gly Ser Tyr Ala Asp
 180 185 190

Tyr Pro Ser Ala Val Ala Gln Trp Tyr Glu Arg Ile Ala Gln Ser Val
 195 200 205

Leu Lys Ala Leu Gln Ser Thr Glu Val His Ala Leu Val Ala Ala Asp
 210 215 220

Glu Glu Leu Trp Thr Gly Pro Pro Val Glu Leu Ala Asp Ala Thr His
 225 230 235 240

Arg Leu

<210> 58

<211> 726

<212> DNA

<213> Mycobacterium tuberculosis

<400> 58

atgacgctag ccaacaatgg aaccggcatg gaccactttc tgacgcccac ggagtacctc	60
gacgcggggc atccgctcgt tcgtacgacg gcagcaaccc tcatccggga cgcggtgtcg	120
gataccgagc gggtcaggcg gatctactac tacgtgcgcg acgtgccata cgacgtcctc	180
gcgtcctttc gctacctcgc gcaggacat caccgcgcca gcgacgtgat cggccacggg	240
gtcgccttct gcatgggcaa ggcaagtcc ttcgtcgccc tgtgccgagc cgccggtgtc	300
cgggcccgta tcgcgttcca gacgatcgac gccccgata aggagtttct gtccccgcag	360

-72-

```

gtacgtgccc tatggggagg ccgaactggc cggcccttcc cgtggcactc gctgggtgag      420
gcatactcttg gtcggcgatg ggtcaagctg gacgccacca tcgacgcacc caccgccgcc      480
cgcctcggca agccctaccg gcaagaattc gacggagcta ccccgatccc gacgggtggaa      540
ggaaccatcc tgcgggaaaa cggcagctac gccgactatc ccagcgcggt cgcgcaatgg      600
tacgaacgaa tcgctcagtc ggtcctgaag gcgttgcaat ccaccgaagt acacgccttg      660
gtagccgctg acgaggaact gtggaccggc cccccggttg aattggccga cgcaaccac      720
cgactg                                           726

```

<210> 59

<211> 499

<212> PRT

<213> Mycobacterium tuberculosis

<400> 59

```

Met Thr Ala Ala Gln Gln Asp Gln Ala Pro Met Ala Thr Pro Gly Cys
1           5           10           15

```

```

Arg Glu Gly Glu Thr Tyr Asp Val Val Val Leu Gly Ala Gly Pro Val
          20           25           30

```

```

Gly Gln Asn Val Ala Asp Arg Ala Arg Ala Gly Gly Leu Arg Val Ala
          35           40           45

```

```

Val Val Glu Arg Glu Leu Val Gly Gly Glu Cys Ser Tyr Trp Ala Cys
          50           55           60

```

```

Val Pro Ser Lys Ala Leu Leu Arg Pro Val Ile Ala Ile Ser Asp Ala
          65           70           75           80

```

```

Arg Arg Val Asp Gly Ala Arg Glu Ala Val Asp Gly Ser Ile Asn Thr
          85           90           95

```

```

Ala Gly Val Phe Gly Arg Arg Asn Arg Tyr Val Ala His Trp Asp Asp
          100          105          110

```

```

Thr Gly Gln Ala Asp Trp Val Ser Gly Ile Gly Ala Thr Leu Ile Arg
          115          120          125

```

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Gly Asp Gly Arg Leu Asp Gly Pro Arg Arg Val Val Val Thr Lys Ser
 130 135 140

Ser Gly Glu Ser Val Ala Leu Thr Ala Arg His Ala Val Val Ile Cys
 145 150 155 160

Thr Gly Ser Arg Pro Ala Leu Pro Asp Leu Pro Gly Ile Thr Glu Ala
 165 170 175

Arg Pro Trp Thr Asn Arg Gln Ala Thr Asp Asn Ser Thr Val Pro Asp
 180 185 190

Arg Leu Ala Ile Val Gly Ala Gly Gly Val Gly Val Glu Met Ala Thr
 195 200 205

Ala Trp Gln Gly Leu Gly Ala Ser Val Thr Leu Leu Ala Arg Gly Ser
 210 215 220

Gly Leu Leu Pro Arg Met Glu Pro Phe Val Gly Glu Leu Ile Gly Arg
 225 230 235 240

Gly Leu Ala Asp Ala Gly Val Asp Val Arg Val Gly Val Ser Val Arg
 245 250 255

Ala Leu Gly Arg Pro Asn Pro Thr Gly Pro Val Val Leu Glu Leu Asp
 260 265 270

Asp Gly Thr Glu Leu Arg Val Asp Glu Val Leu Phe Ala Thr Gly Arg
 275 280 285

Ala Pro Arg Thr Asp Asp Ile Gly Leu Glu Thr Ile Gly Leu Thr Pro
 290 295 300

Gly Ser Trp Leu Asp Val Asp Asp Thr Cys Arg Val Arg Ala Val Asp
 305 310 315 320

Asp Gly Trp Leu Tyr Ala Ala Gly Asp Val Asn His Arg Ala Leu Leu
 325 330 335

Thr His Gln Gly Lys Tyr Gln Ala Arg Ile Ala Gly Thr Ala Ile Gly
 340 345 350

Ala Arg Ala Ala Gly Arg Pro Leu Asp Thr Thr Ser Trp Gly Met His
 355 360 365

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Ala Thr Thr Ala Asp His His Ala Val Pro Gln Ala Phe Phe Thr Asp
 370 375 380

Pro Glu Ala Ala Ala Val Gly Leu Thr Ala Asp Gln Ala Ala Gln Ala
 385 390 395 400

Gly His Arg Ile Lys Ala Ile Asp Val Glu Ile Gly Asp Val Val Met
 405 410 415

Gly Ala Lys Leu Phe Ala Asp Gly Tyr Thr Gly Arg Ala Arg Met Val
 420 425 430

Val Asp Val Asp Arg Gly His Leu Leu Gly Val Thr Met Val Gly Pro
 435 440 445

Gly Ala Ala Glu Leu Leu His Ser Ala Thr Val Ala Val Ala Gly Gln
 450 455 460

Val Pro Ile Asp Arg Leu Trp His Ala Val Pro Cys Phe Pro Thr Ile
 465 470 475 480

Ser Glu Leu Trp Leu Arg Leu Leu Glu Ser Tyr Arg Asp Ser Phe Tyr
 485 490 495

Leu Leu Val

<210> 60

<211> 1497

<212> DNA

<213> Mycobacterium tuberculosis

<400> 60

atgaccgcgg ccacacagga ccaggcgcca atggcaacac ccggctgccg tgagggtgaa 60
 acgtatgacg tcgtcgtgct cggcgcgagg cccgttgagc agaacgtcgc cgatcgtgcc 120
 cgcgcggggg gcctgcgtgt cgcggtggtg gagcgcgaa ctcgtcgggg tgaatgctcc 180
 tattgggcct gtgtgccag caaagccttg ctgcgtccgg tcatcgcgat ctctgacgcc 240
 cgacgggctc acggcgcgcg cgaagcagtc gacggctcga tcaacacagc cggcgtcttt 300

-75-

ggccgcccga accgctatgt ggcccactgg gacgacaccg gccaggccga ctgggtgagt 360
 ggaatcggcg cgacgctgat acgcggtgac gggcgattgg acggtccgcg ccgcgtcgtc 420
 gtcaccaagt cgagcggcga aagcgtggcg ctgaccgccc ggcatgccgt tgtcatctgc 480
 accggaagcc ggccagcact ccccgacctt cctggcatca ccgaagcccg gccatggacc 540
 aatcgccaag ccaccgacaa cagtacggtc cccgaccggc ttgcgatcgt cggcgccggc 600
 ggcgtcggtg tggagatggc gaccgcctgg cagggactgg gcgcctcggg gaccctgctg 660
 gctcggggat ctggcctgct gccccgaatg gaaccgtttg tgggggaact catcggtcgc 720
 ggactggccg acgccggcgt tgacgtgcgc gtgggagtat cggtacgcgc gctgggcccgc 780
 cccaacccaa ctggcccagt ggtcctcgag ctggacgacg gtaccgagct gcgggtcgac 840
 gaggtactct tcgccaccgg ccgagcaccg cgaaccgacg acatcggctt ggagacaata 900
 ggactgacgc cgggcagctg gctggacgtc gatgacacct gccgagtgcg ggctgttgac 960
 gacggctggc tctatgccgc cggcgacgtc aaccatcgcg cgttgctgac ccaccaaggc 1020
 aaataccagg cgcggatcgc cggcaccgcg atcggcgccc gtgccgccgg acgaccgcta 1080
 gacaccacgt cgtggggcat gcacgcgacc accgccgacc atcacgcggg gccgcaggca 1140
 ttctttaccg accccaagc cgcagcggtc ggcctgacag ctgatcaggc cgcacaggct 1200
 ggtcaccgga tcaaagcgat cgatgtcgaa atcggcgatg tcgttatggg agccaagctc 1260
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 ctgggcgtga ccatggttgg cccgggcgcc gccgagctgt tgcatcggc caccgtcgcc 1380
 gtcgccggcc aggtgccaat cgatcggttg tggcacgccg ttccgtgctt cccgaccatc 1440
 agcgaactgt ggctgagact tcttgaatcc taccgagatt cgttttacct gctggta 1497

<210> 61

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 61

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp

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	20		25		30										
Ala	Ala	Ile	Ser	Glu	Val	Ala	Arg	Leu	Leu	Gly	Val	Gly	Cys	Ala	Glu
	35						40					45			
Thr	Val	Arg	Lys	Trp	Val	Arg	Gln	Ala	Gln	Val	Asp	Ala	Gly	Ala	Arg
	50					55					60				
Pro	Gly	Thr	Thr	Thr	Glu	Glu	Ser	Ala	Glu	Leu	Lys	Arg	Leu	Arg	Arg
65					70					75				80	
Asp	Asn	Ala	Glu	Leu	Arg	Arg	Ala	Asn	Ala	Ile	Leu	Lys	Thr	Ala	Ser
			85					90						95	
Ala	Phe	Phe	Ala	Ala	Glu	Leu	Asp	Arg	Pro	Ala	Arg				
			100					105							

<210> 62

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 62

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atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg      60
gtcgcagaga tccgcggtca gcacgattcg gaggggcag cgatcagtga ggtcgcccggt      120
ctacttggtg ttggctgcgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat      180
gccggcgcac ggcccgggac caccgaccgaa gaatccgctg agctgaagcg cttgcggcgg      240
gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg      300
gccgagctcg accggccagc acgc                                     324

```

<210> 63

<211> 217

<212> PRT

<213> Mycobacterium tuberculosis

<400> 63

-77-

Met Leu Val Gly Ala Gln Cys Arg Asp Leu Leu His Trp Arg Phe Cys
 1 5 10 15

Arg Gly Val Pro Pro Arg Ala Thr Asn Asp Thr Asp Ile Ala Gly Thr
 20 25 30

Leu Asn Asn Trp Asp His Phe Glu Ala Ile Arg Ala Thr Phe Arg Ala
 35 40 45

Leu Gly Ser Thr Gly His Arg Phe Leu Ile Ala Asp Arg Ala Val Asp
 50 55 60

Ala Leu Pro Phe Gly Glu Val Glu Ser Pro Thr Gly Thr Thr Arg His
 65 70 75 80

Pro Pro Gly Asn Gln Leu Met Asn Val His Gly Cys Thr Asp Ala Tyr
 85 90 95

Leu Arg Ala Asp Val Leu Pro Leu Pro Gly Gly Leu Thr Val His Leu
 100 105 110

Pro Gln Pro Pro Asn Tyr Ala Val Leu Lys Leu His Ala Trp Leu Asp
 115 120 125

Arg Ser Ala Asp His Asp Tyr Lys Asp Gly Pro Asp Leu Ala Leu Val
 130 135 140

Val His Trp Tyr Ala Gly Asp Leu Asp Arg Leu Tyr Ala Lys Pro Asp
 145 150 155 160

Gln Trp Ala Leu Arg Arg His Asp Phe Asp Leu Arg Thr Ala Ala Ala
 165 170 175

Ala Leu Leu Gly His Asp Met Arg Ala Ser Val Ser Ala Pro Glu Ala
 180 185 190

Ala Val Leu Ala Thr Arg Ala Thr Gln Ala Asp His Asp Leu Leu Ala
 195 200 205

Gln His Phe Ala Val Gly Arg Pro Gly
 210 215

<210> 64

-78-

<211> 651

<212> DNA

<213> Mycobacterium tuberculosis

<400> 64

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atgctcgtcg gggcacagtg ccgcgatcta ctgcactggc gcttctgccg cggggtgccg      60
ccgcggggcca ccaacgacac cgatatcgca gggaccctga acaattggga ccacttcgag      120
gcaattcggg ccaccttcgg cgccctgggc agcaccgggc accgattcct gatcgccgac      180
cgcgccgtcg atgccctccc gttcggcgag gtggagtcgc ccaccggcac aaccgcgcat      240
ccccaggca accagctcat gaacgtccac ggatgcaccg acgcctacct gcgtgccgat      300
gttctgcctc tccctggcgg cctgacagtc caccttcccc aaccgccgaa ctatgcggtc      360
ctcaaactgc acgcatggct cgatcgggtc gcggaccacg actacaaaga cggcccagat      420
ctggccttgg tggcgcactg gtacgccggc gacctcgacc ggctttacgc caaaccagac      480
cagtgggcgc tacgccgtca cgacttcgac ctacgcaccg ccgctgccgc gctgctcggc      540
cacgacatgc gcgccagtgt cagcgcaccg gaggccgccg tgctggcgac gcgcgccaca      600
caggccgacc acgacctgct ggcccagcac ttcgccgtgg gtcgaccggg c              651

```

<210> 65

<211> 342

<212> PRT

<213> Mycobacterium tuberculosis

<400> 65

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Met Asp Gln Ile Gly Ala Asp Leu Ala Glu Ala Val Glu Arg His Leu
1           5           10           15

Thr Glu Tyr Gly Val Arg Val Leu Gly Gly Leu Ser Ala Leu Asn Ser
20           25           30

Ala His Pro Glu Ser Leu Asp Leu Glu Ile Asp Ala His Pro Leu Thr
35           40           45

Ile Thr Ala Leu Tyr Leu Pro His Leu Ser Ala Thr Ala Ala Leu Gln
50           55           60

```

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Ala Trp Asp Thr Ala Gly Ala Gly Ser Pro Leu Leu Val Val Gly Pro
65 70 75 80

Arg Leu His Pro Ser Ser Ala Glu Thr Leu Arg Ala Arg Gly Leu Trp
85 90 95

Tyr Ile Asp Gly Ala Gly Asn Ala Tyr Leu Arg His Gln Gly Gly Leu
100 105 110

Leu Ile Asp Val Arg Gly Arg Arg Ser Ala Val Ser Ala Gln Pro Gly
115 120 125

Thr Leu Gly Asp Gly Leu His Ser Asp Gly Pro Arg Asn Pro Phe Thr
130 135 140

Pro Lys Arg Ala Gln Val Val Cys Val Leu Leu Asp Ala Pro Gln Leu
145 150 155 160

Val Asp Ala Pro Leu Arg Ala Ile Ala Ala Ser Ala Gly Val Ser Val
165 170 175

Gly Met Ala Lys Glu Thr Met Asp Thr Leu Arg Thr Thr Gly Phe Phe
180 185 190

Glu His Leu Gly Ser Arg Arg Arg Leu Val Arg Thr Asp Glu Leu Leu
195 200 205

Asp Leu Trp Ala Ala Ala Tyr Pro Gly Gly Leu Gly Arg Ala Asn Lys
210 215 220

Leu Leu Val Ala Ser Gly Asp Ile His Thr Trp Ser Ala Pro Asp Gly
225 230 235 240

Leu Ala Val Ala Val Ser Gly Glu Gln Ala Leu Pro Asp Glu Ile Arg
245 250 255

Asn Pro Glu Ser Leu Met Leu Tyr Val Asp Thr Pro Ala Pro Gly Leu
260 265 270

Pro Ala Asp Leu Leu Ile His Asn Arg Trp His Arg Asp Pro His Gly
275 280 285

Ser Ile Val Ile Arg Lys Leu Phe Trp Arg Asn Leu Pro Asp Glu Gln

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290		295		300
Pro Gly Leu Ala Pro Thr Ala Leu Ile Tyr Ala Asp Leu Leu Ala Ser				
305		310		315
				320
Arg Glu Pro Arg Gln Val Glu Val Ala His Leu Met Arg Arg Gln Asp				
	325		330	335
Glu Arg Leu Ala Arg Leu				
340				

<210> 66

<211> 1026

<212> DNA

<213> Mycobacterium tuberculosis

<400> 66

atggatcaga tcggggctga cctcgctgag gccgctgagc gtcacctcac cgaatacggg	60
gtgcgggtgc tcgggtggcct atcagcattg aactccgcgc atcccgaaac actagacott	120
gagatcgacg ctacccccct cagatcact gccctctacc ttctcacct gtcggcaacg	180
gcagcactgc aggctggga taccgccggc gctggttcgc cgctgcttgt ggtgggccc	240
cgtctgcac cgctcgagcg tgaaacgctg cgggctcgcg gactctggta catcgacgga	300
gctgggaacg cttatttgcg gcaccagggt ggctgctca tcgacgtgcg cggccgacgg	360
tcagctgtgt ccgcacaacc gggcaccctc ggtgacggac tgcacagcga tggaccgct	420
aaccggttta cccccaagcg cgcgcagggt gtctgcgtac tgcttgacgc accgcaactg	480
gtcgacgcgc cgctgcgtgc gatcgccgcg agcgccggcg tctcggtcgg tatggccaag	540
gagacgatgg atacgttgcg cactaccggc ttcttcgaac acctcggtc ccgccgacgg	600
ctggtgcgca ccgatgagct gctggacctg tgggcggtcg cctatccggg gggctctgggc	660
cgggccaaca aactcctggt cgccagtggg gatatccaca cgtgggtccgc acccgacgga	720
ctcgcagtgg cggtcagcgg ggaacaggcc ctgcccgaag aaatccgcaa tcccgaatca	780
ctgatgctct acgtcgacac cccagcgccc gggctaccgg ccgacctgct tatacacaac	840
cgctggcacc gcgaccaca cggcagcatc gtgatccgaa agctattctg gcgcaacct	900
cctgacgagc aaccgggggt ggctcccaag gccttgatct atgccgacct ccttgccctg	960

-81-

cgcgagccgc gccaggtcga agtcgcccac ctcatgagaa ggcaggatga gcgactcgcc 1020
cgatta 1026

<210> 67

<211> 286

<212> PRT

<213> Mycobacterium tuberculosis

<400> 67

Val Glu Gly Thr Ile Ala Val Pro Gly Gly Arg Val Trp Phe Gln Arg
1 5 10 15

Ile Gly Gly Gly Pro Gly Arg Pro Leu Leu Val Val His Gly Gly Pro
20 25 30

Gly Leu Pro His Asn Tyr Leu Ala Pro Leu Arg Arg Leu Ser Asp Glu
35 40 45

Arg Glu Val Ile Phe Trp Asp Gln Leu Gly Cys Gly Asn Ser Ala Cys
50 55 60

Pro Ser Asp Val Asp Leu Trp Thr Met Asn Arg Ser Val Ala Glu Met
65 70 75 80

Ala Thr Val Ala Glu Ala Leu Ala Leu Thr Arg Phe His Ile Phe Ser
85 90 95

His Ser Trp Gly Gly Met Leu Ala Gln Gln Tyr Val Leu Asp Lys Ala
100 105 110

Pro Asp Ala Val Ser Leu Thr Ile Ala Asn Ser Thr Ala Ser Ile Pro
115 120 125

Glu Phe Ser Ala Ser Leu Val Ser Leu Lys Ser Cys Leu Asp Val Ala
130 135 140

Thr Arg Ser Ala Ile Asp Arg His Glu Ala Ala Gly Thr Thr His Ser
145 150 155 160

Ala Glu Tyr Gln Ala Ala Ile Arg Thr Trp Asn Glu Thr Tyr Leu Cys

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165 170 175
 Arg Thr Arg Pro Trp Pro Arg Glu Leu Thr Glu Ala Phe Ala Asn Met
 180 185 190
 Gly Thr Glu Ile Phe Glu Thr Met Phe Gly Pro Ser Asp Phe Arg Ile
 195 200 205
 Val Gly Asn Val Arg Asp Trp Asp Val Val Asp Arg Leu Ala Asp Ile
 210 215 220
 Ala Val Pro Thr Leu Leu Val Val Gly Arg Phe Asp Glu Cys Ser Pro
 225 230 235 240
 Glu His Met Arg Glu Met Gln Gly Arg Ile Ala Gly Ser Arg Leu Glu
 245 250 255
 Phe Phe Glu Ser Ser Ser His Met Pro Phe Ile Glu Glu Pro Ala Arg
 260 265 270
 Phe Asp Arg Val Met Arg Glu Phe Leu Arg Leu His Asp Ile
 275 280 285

<210> 68

<211> 858

<212> DNA

<213> Mycobacterium tuberculosis

<400> 68

gtggagggga caatcgcggt cccgggtgga cgcgtctggt tccagcggat tgggtggcggt 60
 cctggtcgtc cgctgcttgt agtgcacggt gggccgggct tgccgcacaa ctacttggcc 120
 ccactgcgac ggttgtctga tgagcgggag gtcattctct gggaccagct cggttgcgga 180
 aattccgcat gtccgtcaga cgtagacctt tggacgatga accgctcagt ggccgagatg 240
 gcaaccgtgg cggaagccct tgcccttacc cgctttcaca tcttcagcca ttcgtgggggt 300
 gggatgctgg cacagcagta cgtgctcgac aaggcgctg acgccgtcag tctgaccatc 360
 gcgaacagca cggcttcgat acccgaattt tcggccagtc tggtcagctt gaagtctgac 420
 ttggacgtgg caactcgctc ggcaattgac cgtcacgagg cggccggcac caccattcc 480

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```

gccgaatacc aggccgcgat cagaacctgg aacgagactt atctgtgccg caccgcgcc 540
tggccccggg aactcacgga agcattcgcc aacatgggaa cagagatctt cgagacgatg 600
tttgggcccc ggcactttcg catcgttggg aatgttcgag actgggacgt cgtcgaccgg 660
ttggccgaca tcgcggtgcc gaccttgctg gtgggtgggcc gtttcgacga atgttcgcct 720
gagcacatgc gagaaatgca gggccggatt gcgggctcgc gattggaatt cttcgagtcc 780
agttcccaca tgccgttcat cgaagagccg gcgcgattcg accgggtgat gcgtgaattc 840
cttcggctgc acgatatt 858

```

<210> 69

<211> 419

<212> PRT

<213> Mycobacterium tuberculosis

<400> 69

```

Met Gly Ala Arg Ala Ile Phe Arg Gly Phe Asn Arg Pro Ser Arg Val
1           5           10           15

```

```

Leu Met Ile Asn Gln Phe Gly Ile Asn Ile Gly Phe Tyr Met Leu Met
          20           25           30

```

```

Pro Tyr Leu Ala Asp Tyr Leu Ala Gly Pro Leu Gly Leu Ala Ala Trp
          35           40           45

```

```

Ala Val Gly Leu Val Met Gly Val Arg Asn Phe Ser Gln Gln Gly Met
          50           55           60

```

```

Phe Phe Val Gly Gly Thr Leu Ala Asp Arg Phe Gly Tyr Lys Pro Leu
65           70           75           80

```

```

Ile Ile Ala Gly Cys Leu Ile Arg Thr Gly Gly Phe Ala Leu Leu Val
          85           90           95

```

```

Val Ala Gln Ser Leu Pro Ser Val Leu Ile Ala Ala Ala Ala Thr Gly
          100          105          110

```

```

Phe Ala Gly Ala Leu Phe Asn Pro Ala Val Arg Gly Tyr Leu Ala Ala
          115          120          125

```

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Glu Ala Gly Glu Arg Lys Ile Glu Ala Phe Ala Met Phe Asn Val Phe
 130 135 140

Tyr Gln Ser Gly Ile Leu Leu Gly Pro Leu Val Gly Leu Val Leu Leu
 145 150 155 160

Ala Leu Asp Phe Arg Ile Thr Val Leu Ala Ala Ala Gly Val Phe Gly
 165 170 175

Leu Leu Thr Val Ala Gln Leu Val Ala Leu Pro Gln His Arg Ala Asp
 180 185 190

Ser Glu Arg Glu Lys Thr Ser Ile Leu Gln Asp Trp Arg Val Val Val
 195 200 205

Arg Asn Arg Pro Phe Leu Thr Leu Ala Ala Ala Met Thr Gly Cys Tyr
 210 215 220

Ala Leu Ser Phe Gln Ile Tyr Leu Ala Leu Pro Met Gln Ala Ser Ile
 225 230 235 240

Leu Met Pro Arg Asn Gln Tyr Leu Leu Ile Ala Ala Met Phe Ala Val
 245 250 255

Ser Gly Leu Val Ala Val Gly Gly Gln Leu Arg Ile Thr Arg Trp Phe
 260 265 270

Ala Val Arg Trp Gly Ala Glu Arg Ser Leu Val Val Gly Ala Thr Ile
 275 280 285

Leu Ala Ala Ser Phe Ile Pro Val Ala Val Ile Pro Asn Gly Gln Arg
 290 295 300

Phe Gly Val Ala Val Ala Val Met Ala Leu Val Leu Ser Ala Ser Leu
 305 310 315 320

Leu Ala Val Ala Ser Ala Ala Leu Phe Pro Phe Glu Met Arg Ala Val
 325 330 335

Val Ala Leu Ser Gly Asp Arg Leu Val Ala Thr His Tyr Gly Phe Tyr
 340 345 350

Ser Thr Ile Val Gly Val Gly Val Leu Val Gly Asn Leu Ala Ile Gly
 355 360 365

-85-

Ser Leu Met Ser Ala Ala Arg Arg Leu Asn Thr Asp Glu Ile Val Trp
 370 375 380

Gly Gly Leu Ile Leu Val Gly Ile Val Ala Val Ala Gly Leu Arg Arg
 385 390 395 400

Leu Asp Thr Phe Thr Ser Gly Ser Gln Asn Met Thr Gly Arg Trp Ala
 405 410 415

Ala Pro Arg

<210> 70

<211> 1257

<212> DNA

<213> Mycobacterium tuberculosis

<400> 70

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cagttcggca tcaacatcgg cttctacatg ctgatgccgt acctggccga ctacctagcc	120
gggccactgg ggctagccgc gtgggcgggtg ggtctggtga tgggcgtgcg caatttctcc	180
cagcagggca tggtcttcgt ggggtggcacg ctggccgata ggttcggcta caagccactg	240
atcatcgccg gatgtctgat ccgcaccggc gggtttgcc tgcctgggtg cgcccagtcg	300
ctgccagtg tgctgatcgc cgcggctgcc acgggctttg ccggcgcgct gttcaatccc	360
gcggtgcgcg gctatctcgc ggccgaagcc ggggaacgca agatcgaagc gttcgcgatg	420
ttcaacgtct tctaccagtc ggggatcctg ctcggcccgc tggttggatt agtattgctg	480
gcgctggatt tccggatcac ggtgctggcc gccgccggtg tggtcggcct actcacgctc	540
gcgcagctgg tcgcactgcc ccaacaccgg gccgactcgg agcgcgaaaa aacatcgatc	600
ctgcaggact ggcggtcgt cgttcgcaac cgtccgtttc tgacgttagc cgcgcgatg	660
accggatgct atgcgctgct gttccagatc tatctggctc tgcccatgca ggcgtcgatc	720
ctcatgccac gcaaccaata tctcttgatt gcggcgatgt tcgcggtatc gggctctggtc	780
gccgtcggcg ggcagctgcg catcacccgc tggttcgccg tcagatgggg ggccgagcgc	840
agcctggtag tcggcgcgac gattttggcg gcctcgttca tcccggttgc agtcatccca	900

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aacggccagc ggttcggcgt cgccgttgcg gtcattggcat tgggtgctgtc ggcgagtctg 960
 ctggcggttg cctcggcagc gttgtttcct ttcgaaatgc gtgccgtggg cgcactgtcg 1020
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 gaaattgttt gggggcggatt gattctggtg ggcattcgtt cgggtggccgg gctccgtcgg 1200
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<210> 71

<211> 593

<212> PRT

<213> Mycobacterium tuberculosis

<400> 71

Met Ser Ala Lys Glu Arg Gly Asp Gln Asn Ala Val Val Asp Ala Leu
 1 5 10 15

Arg Ser Ile Gln Pro Ala Val Phe Ile Pro Ala Ser Val Val Ile Val
 20 25 30

Ala Met Ile Val Val Ser Val Val Tyr Ser Ser Val Ala Glu Asn Ala
 35 40 45

Phe Val Arg Leu Asn Ser Ala Ile Thr Gly Gly Val Gly Trp Trp Tyr
 50 55 60

Ile Leu Val Ala Thr Gly Phe Val Val Phe Ala Leu Tyr Cys Gly Ile
 65 70 75 80

Ser Arg Ile Gly Thr Ile Arg Leu Gly Arg Asp Asp Glu Leu Pro Glu
 85 90 95

Phe Ser Phe Trp Ala Trp Leu Ala Met Leu Phe Ser Ala Gly Met Gly
 100 105 110

Ile Gly Leu Val Phe Tyr Gly Val Ala Glu Pro Leu Ser His Tyr Leu
 115 120 125

Arg Pro Pro Arg Ser Arg Gly Val Pro Ala Leu Thr Asp Ala Ala Ala

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130

135

140

Asn Gln Ala Met Ala Leu Thr Val Phe His Trp Gly Leu His Ala Trp
 145 150 155 160

Ala Ile Tyr Val Val Val Gly Leu Gly Met Ala Tyr Met Thr Tyr Arg
 165 170 175

Arg Gly Arg Pro Leu Ser Val Arg Trp Leu Leu Glu Pro Val Val Gly
 180 185 190

Arg Gly Arg Val Glu Gly Ala Leu Gly His Ala Val Asp Val Ile Ala
 195 200 205

Ile Val Gly Thr Leu Phe Gly Val Ala Thr Ser Leu Gly Phe Gly Ile
 210 215 220

Thr Gln Ile Ala Ser Gly Leu Glu Tyr Leu Gly Trp Ile Arg Val Asp
 225 230 235 240

Asn Trp Trp Met Val Gly Met Ile Ala Ala Ile Thr Ala Thr Ala Thr
 245 250 255

Ala Ser Val Val Ser Gly Val Ser Lys Gly Leu Lys Trp Leu Ser Asn
 260 265 270

Ile Asn Met Ala Leu Ala Ala Ala Leu Ala Leu Phe Val Leu Leu Leu
 275 280 285

Gly Pro Thr Leu Phe Leu Leu Gln Ser Trp Val Gln Asn Leu Gly Gly
 290 295 300

Tyr Val Gln Ser Leu Pro Gln Phe Met Leu Arg Thr Ala Pro Phe Ser
 305 310 315 320

His Asp Gly Trp Leu Gly Asp Trp Thr Ile Phe Tyr Trp Gly Trp Trp
 325 330 335

Ile Ser Trp Ala Pro Phe Val Gly Met Phe Ile Ala Arg Ile Ser Arg
 340 345 350

Gly Arg Thr Ile Arg Glu Phe Ile Gly Ala Val Leu Leu Val Pro Thr
 355 360 365

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Val Ile Ala Ser Leu Trp Phe Thr Ile Phe Gly Asp Ser Ala Leu Leu
 370 375 380

Arg Gln Arg Asn Asn Gly Asp Met Leu Val Asn Gly Ala Val Asp Thr
 385 390 395 400

Asn Thr Ser Leu Phe Arg Leu Leu Asp Gly Leu Pro Ile Gly Ala Ile
 405 410 415

Thr Ser Val Leu Ala Val Leu Val Ile Val Phe Phe Phe Val Thr Ser
 420 425 430

Ser Asp Ser Gly Ser Leu Val Ile Asp Ile Leu Ser Ala Gly Gly Glu
 435 440 445

Leu Asp Pro Pro Lys Leu Thr Arg Val Tyr Trp Ala Val Leu Glu Gly
 450 455 460

Val Ala Ala Ala Val Leu Leu Leu Ile Gly Gly Ala Gly Ser Leu Thr
 465 470 475 480

Ala Leu Arg Thr Ala Ala Ile Ala Thr Ala Leu Pro Phe Ser Ile Val
 485 490 495

Met Val Val Ala Cys Tyr Ala Met Thr Lys Ala Phe His Phe Asp Leu
 500 505 510

Ala Ala Thr Pro Arg Leu Leu His Val Thr Val Pro Asp Val Val Ala
 515 520 525

Ala Gly Asn Arg Arg Arg His Asp Ile Ser Ala Thr Leu Ser Gly Leu
 530 535 540

Ile Ala Val Arg Asp Val Asp Ser Gly Thr Tyr Ile Val His Pro Asp
 545 550 555 560

Thr Gly Ala Leu Thr Val Thr Ala Pro Pro Asp Pro Leu Asp Asp His
 565 570 575

Val Phe Glu Ser Asp Arg His Val Thr Arg Arg Asn Thr Thr Ser Ser
 580 585 590

Arg

<210> 72

<211> 1779

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 72

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tactcgagcg tcgccgagaa tgcgttcggt cggctgaact ccgcgatcac cggcggcgctc	180
gggtgggtgg acatcctggg tgccaccggg tttgtgggtat tcgcgctgta ctgcggcatt	240
tcccggattg gcactatccg gctggggcgc gacgatgagc tccccgagtt cagcttctgg	300
gcatggctgg caatgctgtt tagtgccggg atgggtatcg gcctgggtctt ctacgggggtg	360
gccgagccgc tcagccacta cctgcggcca ccgcgggtcac gcggcgtgcc cgcgcttact	420
gatgcggcgg ctaaccaggc gatggcgctg acagtgttcc actggggcct gcacgcctgg	480
gcaatttatg tcgtgggttg cctcgggtat gcgtacatga cctatcggcg gggtcgcccc	540
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gggcacgcgg tggacgtcat cgccattgtc ggaacactct ttggtgtcgc cacgtcactg	660
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aactggtgga tggtcggcat gatcgccgc atcaccgcca ctgcgacggc gtcgggtggc	780
agtgggggtc gcaaggggtt gaagtggctg tcgaacatca atatggcgct ggccgccgca	840
ttggccctgt tcgtgttggt gtcggggccg acacttttct tgctgcagtc gtgggtgcaa	900
aatttgggag gctacgtcca gtcgcttcgc caattcatgc tgcgcaccgc gccgttctcg	960
cacgacggct ggctcggcga ctggactatc ttctactggg gttggtggat cagctgggct	1020
ccgtttgtcg ggatgttcat cgcgcggatt tcgcggggac ggacgatccg ggagttcatc	1080
ggggcggtgc tgctcgttcc caccgtgac gcctcgctat ggtttacgat cttcggtgac	1140
tcggcgttgt tcgggcaacg caacaacggc gacatgctcg tcaacggggc ggtagacacc	1200
aacacatcgc ttttccgatt gctggacggg ttgcctatcg gggctattac cagcgttctt	1260
gctgtgctgg tgatcgtgtt cttcttcggt acgtcgtcgg actccgggtc gttgggtcatc	1320
gacatcttgt cagcgggtgg tgagctggac ccgcccaagc tgaccagggt ctactgggcg	1380

-90-

gtgttgagg gggtagccgc ggccgttttg ctctgatcg gaggtgctgg gtcactgacc 1440
 gcgttgcgga cggccgctat tgccacggcc ctgccgttct caatcgatcat ggtgggtggcg 1500
 tgctatgcga tgaccaaagc gttccacttc gacctggccg ccacacctag gctgctgcac 1560
 gtcaccgtgc ctgacgtggt tgccggcagga aaccggcgac gccacgatat ctccggcgacg 1620
 ctgtcggggc tcattgccgt ccgtgatgtc gatagcggca catatatagt ccaccccgac 1680
 accggcgctc tcaccgtcac tgcaccacca gatccgttgg acgatcatgt ttttgagtct 1740
 gatcggcacg taacgcgaag aaacacaaca tcacgaga 1779

<210> 73

<211> 331

<212> PRT

<213> Mycobacterium tuberculosis

<400> 73

Met Ser Phe Val Asn Val Ala Pro Gln Leu Val Ser Thr Ala Ala Ala
 1 5 10 15

Asp Ala Ala Arg Ile Gly Ser Ala Ile Asn Thr Ala Asn Thr Ala Ala
 20 25 30

Ala Ala Thr Thr Gln Val Leu Ala Ala Ala Gln Asp Glu Val Ser Thr
 35 40 45

Ala Ile Ala Ala Leu Phe Gly Ser His Gly Gln His Tyr Gln Ala Ile
 50 55 60

Ser Ala Gln Val Ala Ala Tyr Gln Gln Arg Phe Val Leu Ala Leu Ser
 65 70 75 80

Gln Ala Gly Ser Thr Tyr Ala Val Ala Glu Ala Ala Ser Ala Thr Pro
 85 90 95

Leu Gln Asn Val Leu Asp Ala Ile Asn Ala Pro Val Gln Ser Leu Thr
 100 105 110

Gly Arg Pro Leu Ile Gly Asp Gly Ala Asn Gly Ile Asp Gly Thr Gly
 115 120 125

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Gln Ala Gly Gly Asn Gly Gly Trp Leu Trp Gly Asn Gly Gly Asn Gly
 130 135 140

Gly Ser Gly Ala Pro Gly Gln Ala Gly Gly Ala Gly Gly Ala Ala Gly
 145 150 155 160

Leu Ile Gly Asn Gly Gly Ala Gly Gly Thr Gly Gly Ala Val Ser Leu
 165 170 175

Ala Arg Ala Gly Thr Ala Gly Gly Ala Gly Arg Gly Pro Val Gly Gly
 180 185 190

Ile Gly Gly Ala Gly Gly Val Gly Gly Ala Gly Gly Ala Ala Gly Ala
 195 200 205

Val Thr Thr Ile Thr His Ala Ser Phe Asn Asp Pro His Gly Val Ala
 210 215 220

Val Asn Pro Gly Gly Asn Val Tyr Val Thr Asn Phe Gly Ser Gly Thr
 225 230 235 240

Val Ser Val Ile Asn Pro Ala Thr Asn Thr Val Thr Gly Ser Pro Ile
 245 250 255

Thr Ile Gly Asn Gly Pro Ser Gly Val Ala Val Ser Pro Val Thr Gly
 260 265 270

Leu Val Phe Val Thr Asn Phe Asp Ser Asn Thr Val Ser Val Ile Asp
 275 280 285

Pro Thr Thr Asn Thr Val Thr Gly Ser Pro Ile Thr Val Gly Thr Ala
 290 295 300

Pro Thr Gly Val Ala Val Asn Pro Val Thr Gly Glu Val Tyr Val Thr
 305 310 315 320

Asn Phe Ala Gly Asp Thr Val Ser Val Ile Ser
 325 330

<210> 74

<211> 993

<212> DNA

-92-

<213> *Mycobacterium tuberculosis*

<400> 74

```

atgtcgtttg tcaacgtggc cccacagtta gtgtccacag ccgcgggccga tgcagcgcg 60
atcggctcgg cgatcaacac cgccaacacc gcggcgggcg cgaccacca ggtgttggcc 120
gccgccaag acgaggtgtc aacggcgatc gccgcgctgt tcggcagcca cggccagcac 180
tatcaagcga tcagcgcgca ggtcgcggcc tatcagcaac ggttcgtgct ggccttaagc 240
caagctggca gcacctacgc ggtcgccgaa gcggccagcg caacaccgct gcagaacgtg 300
ctcgatgcga tcaacgcacc cgttcagtcg ctgaccgggc gccattgat cggcgacggc 360
gcgaacggga tcgacgggac cgggcaagcc ggcggtaacg gcgggtggct gtggggcaac 420
ggcggaacg gcgggtcggg ggcacccgga caggccggcg gcgccggcg ggcgccggg 480
ttgatcggca acggtggggc cggcggcacc ggcggcgcgg tcagcctcgc ccgcgcggc 540
acggccggcg gtgccggccg cggcccggtc ggcggtatcg gcggtgcggg tggggtcggc 600
ggtgccggtg gggccgccgg cgcgcgcacc accatcacc acgccagctt caacgatccg 660
cacggggtgg cggtaaccc gggcggaac gtctacgtca ccaatttcgg cagcggcacg 720
gtgtcgggta tcaacccgc caccaacacc gtcaccggct ccccatcac catcggcaac 780
ggtccaagcg ggggtggcgg cagccccgtc accggcctgg tcttcgtgac caacttcgac 840
agcaacacgg tgtcgggtgat cgaccgcacc accaacaccg tcaccgggtc ccccatcacc 900
gtcggcaccg ctccgaccgg ggtggcggtc aacccccgtc ccggcgaggt ttatgtcacc 960
aacttcgccg gcgacacggt gtcggtaatc agc 993

```

<210> 75

<211> 251

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 75

```

Met Arg Ala Asp Val Thr Ala Glu His Leu Thr Gln Val Val Arg Asp
1           5           10          15

Phe Ala Val Ile Asp Ile Asp Asp Gly Val Ala Phe Asn Leu Asp Thr
20          25          30

```

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Ser Ser Val Gln Glu Ile Arg Glu Arg Ala Asp Tyr Pro Gly Leu Arg
 35 40 45

Val Arg Val Ala Met Ser Val Gly Pro Trp Gln Gly Ile Ala Ala Trp
 50 55 60

Asp Val Ser Thr Gly Glu Pro Ile Ala Pro Trp Pro Thr Arg Val Thr
 65 70 75 80

Ile Asp Arg Ile Leu Gly Glu Pro Ile Thr Leu Leu Gly Tyr Ala Pro
 85 90 95

Glu Thr Ile Ile Ala Glu Lys Gly Val Thr Ile Leu Glu Arg Gly Ile
 100 105 110

Thr Ser Thr Arg Trp Arg Asp Tyr Val Asp Ile Val Gln Leu Asp Arg
 115 120 125

Arg Gly Ile Asp Asp Asp Glu Leu Leu Arg Ser Ala Arg Ala Val Ala
 130 135 140

Gln Tyr Arg Gly Ala Thr Leu Glu Pro Val Ala Pro His Leu Ala Gly
 145 150 155 160

Tyr Gly Ala Val Ala Gln Ala Lys Trp Ala Thr Glu His Gly Arg Cys
 165 170 175

Gln His Cys Trp Arg His Trp Lys Pro Ala His Val Gly Arg Arg Asn
 180 185 190

Met Asp Leu Leu Asp Ala Lys Gln Val Ser Glu Met Ile Gly Val Pro
 195 200 205

Val Gly Thr Leu Arg His Trp Arg His Ser Asp Ile Gly Pro Ala Ser
 210 215 220

Phe Thr Leu Gly Arg Arg Val Val Tyr Arg Arg Asp Glu Val Ser Arg
 225 230 235 240

Trp Ile Ser Lys Arg Glu Ser Ala Thr Arg Arg
 245 250

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<211> 753

<212> DNA

<213> Mycobacterium tuberculosis

<400> 76

```

atgcgcgcgcg acgtcaccgc cgagcatctc acccaggtgg ttcgcgacat cgccgtgatc      60
gacatcgacg acgggggtggc gttcaacctc gacacgagca gcgtgcagga aattcgcgag      120
cgggccgact acccgggcct gcgcgtgcga gtcgctatgt cggtcggacc gtggcagggc      180
atcgcggcct gggatgtgtc caccggcgaa ccgacgcgcg cgtggcccac acgggtgacc      240
atcgaccgga tcctcggcga gccgatcaca ctctgggct acgcgccga gaccatcatc      300
gccgagaagg gagtgaccat cctcgaacgc ggcacacca gcaccgctg gcgggactac      360
gtcgacatcg tccaactcga ccgccggggc atcgacgacg acgagctgct ccgctcggcc      420
agggcagtcg cacaataccg cggcgccact ctgaacccg tcgcgcctca cctggccggt      480
tatggcgcag tcgcgcaagc gaaatgggcg accgaacacg gacgctgcca gcactgttgg      540
agacattgga aaccagccca tgtcgggagg agaaacatgg atctgctgga cgcaaaacaa      600
gtttcggaga tgatcggcgt tcccgtcggc actctacggc actggcgga ctcggacatc      660
ggaccggcga gttcacctt gggacggcgc gtcgtgtacc ggcgcgacga ggtgtcgcgc      720
tggatctcaa agcgggagag cgcaactcga cgt                                     753

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<210> 77

<211> 254

<212> PRT

<213> Mycobacterium tuberculosis

<400> 77

```

Met Ser Val Asp Tyr Pro Gln Met Ala Ala Thr Arg Gly Arg Ile Glu
1           5           10           15

```

```

Pro Ala Pro Arg Arg Val Arg Gly Tyr Leu Gly His Val Leu Val Phe
          20           25           30

```

```

Asp Thr Ser Ala Ala Arg Tyr Val Trp Glu Val Pro Tyr Tyr Pro Gln
35           40           45

```

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Tyr Tyr Ile Pro Leu Ala Asp Val Arg Met Glu Phe Leu Arg Asp Glu
 50 55 60

Asn His Pro Gln Arg Val Gln Leu Gly Pro Ser Arg Leu His Ser Leu
 65 70 75 80

Val Ser Ala Gly Gln Thr His Arg Ser Ala Ala Arg Val Phe Asp Val
 85 90 95

Asp Gly Asp Ser Pro Val Ala Gly Thr Val Arg Phe Asn Trp Asp Pro
 100 105 110

Leu Arg Trp Phe Glu Glu Asp Glu Pro Ile Tyr Gly His Pro Arg Asn
 115 120 125

Pro Tyr Gln Arg Ala Asp Ala Leu Arg Ser His Arg His Val Arg Val
 130 135 140

Glu Leu Asp Gly Ile Val Leu Ala Asp Thr Arg Ser Pro Val Leu Leu
 145 150 155 160

Phe Glu Thr Gly Ile Pro Thr Arg Tyr Tyr Ile Asp Pro Ala Asp Ile
 165 170 175

Ala Phe Glu His Leu Glu Pro Thr Ser Thr Gln Thr Leu Cys Pro Tyr
 180 185 190

Lys Gly Thr Thr Ser Gly Tyr Trp Ser Val Arg Val Gly Asp Ala Val
 195 200 205

His Arg Asp Leu Ala Trp Thr Tyr His Tyr Pro Leu Pro Ala Val Ala
 210 215 220

Pro Ile Ala Gly Leu Val Ala Phe Tyr Asn Glu Lys Val Asp Leu Thr
 225 230 235 240

Val Asp Gly Val Ala Leu Pro Arg Pro His Thr Gln Phe Ser
 245 250

<210> 78

<211> 762

<212> DNA

-96-

<213> *Mycobacterium tuberculosis*

<400> 78

```

atgagcgtgg attaccccca aatggctgct acccggggaa gaatagaacc ggccccgcgg      60
cgagttcgcg gctatctcgg acatgtgctc gtcttcgaca ccagtgcggc gcgctatgtc      120
tgaggaggttc cctactaccc gcagtactac atcccgtggt cggatgtccg catggaggtc      180
ctgcgcgacg agaaccaccc gcagcgagtg cagctgggtc cgtcgcgggt gcactccttg      240
gtaagcgccg gtcagaccca ccgatcggcg gcgcgggtat tcgatgtcga cggcgacagc      300
ccggtggcgg gcaccgtgcg tttcaactgg gatccgctgc ggtggttcga ggaggacgag      360
ccgatctacg gccatccgcg caatccctat cagcggggccg atgcgctgcg ctcgcaccga      420
cacgtccgtg tcgagctgga cggcattgtg ctcgctgaca ccgatcgcc cgttctgcta      480
ttcgaaactg ggatacccac aaggtattac atcgatccgg ccgacatcgc ttctgagcat      540
ctggagccca cctcgacgca gacgttgtgt ccgtacaagg ggacgacgtc gggctattgg      600
tctgtgcgcg tcggcgacgc cgtgcaccgc gacctggcct ggacgtatca ctatccactg      660
cccgccgttg ccccgatcgc cggcctggtg gcgttttaca acgagaaggt cgacctcacc      720
gtcgacggcg tcgcctgcc gcggccgcac actcagttca gc                          762

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<210> 79

<211> 120

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 79

```

Ser Phe Ala Gly Ala Glu Ala Ala Asn Ala Ser Gln Leu Gln Ser Ile
1           5           10          15

Ala Arg Gln Val Arg Gly Ala Val Asn Ala Val Ala Gly Gln Val Thr
          20          25          30

Gly Asn Gly Gly Ser Gly Asn Ser Gly Thr Ser Ala Ala Ala Asn
          35          40          45

Pro Asn Ser Asp Asn Thr Ala Ser Ile Ala Asp Arg Gly Thr Ser Ala
          50          55          60

```

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Ile Met Thr Thr Ala Ser Ala Thr Ala Ser Ser Thr Gly Val Asp Gly
 65 70 75 80

Gly Ile Ala Ala Thr Tyr Ala Val Ala Ser Gln Trp Asp Gly Gly Tyr
 85 90 95

Val Ala Asn Tyr Thr Ile Thr Gln Phe Gly Arg Asp Phe Asp Asp Arg
 100 105 110

Leu Ala Val Ala Ile His Phe Ala
 115 120

<210> 80

<211> 360

<212> DNA

<213> Mycobacterium tuberculosis

<400> 80

tcttttcgccg gcgcccaggc cgccaatgcg tcacagctgc agagcatcgc gcggcaggtg 60
 cggggcgccg tcaacgccgt cgccggtcag gtgacgggca atggcggctc cggcaacagc 120
 ggcaacttcgg ctgcggcgcc caaccgaat tccgacaaca cagcgagcat cgccgatagg 180
 ggcacaagcg ccatcatgac caaggcaagc gcgaccgcgt cttccacggg cgtcgatggc 240
 ggaatagcgg cgacgtatgc ggtcgccctcg caatgggatg gtggctacgt ggccaattac 300
 acgatcacc aattcggggc cgacttcgat gaccgattgg cggttgcaat tcactttgcc 360

<210> 81

<211> 470

<212> PRT

<213> Mycobacterium tuberculosis

<400> 81

Val Ala Thr Val Ala Phe Val Ala Thr Ala Ser Ile Val Ile Thr Pro
 1 5 10 15

Ala Ala Ile Val Leu Leu Gly Pro Arg Leu Asp Ala Leu Asp Val Arg

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20	25	30
Arg Leu Val Arg Arg Leu Leu Gly Arg Pro Asp Pro Val His Lys Pro		
35	40	45
Val Lys Gln Leu Phe Trp Tyr Arg Ser Ser Lys Phe Val Met Arg Arg		
50	55	60
Trp Leu Pro Val Gly Thr Ala Val Val Ala Leu Leu Val Leu Leu Gly		
65	70	75
Leu Pro Phe Leu Ser Val Lys Trp Gly Phe Pro Asp Asp Arg Val Leu		
85	90	95
Pro Arg Ser Ala Ser Ala Arg Gln Val Gly Asp Ile Leu Arg Asp Asp		
100	105	110
Phe Gly His Asp Pro Ala Thr Gln Ile Pro Ile Val Val Pro Asp Ala		
115	120	125
Arg Gly Leu Gly Pro Val Glu Leu Asp Ser Tyr Ala Ala Glu Leu Ser		
130	135	140
Arg Val Pro Asp Val Ser Ala Val Ala Ala Pro Thr Gly Thr Phe Val		
145	150	155
Asp Gly Ser Trp Val Gly Thr Pro Arg Gly Ala Thr Gly Leu Ala Glu		
165	170	175
Gly Ser Ala Phe Leu Thr Val Ser Ser Thr Ala Pro Leu Phe Ser Arg		
180	185	190
Ala Ser Asp Ile Gln Leu Lys Arg Leu His Gln Val Ala Gly Pro Ala		
195	200	205
Gly Arg Ser Val Val Met Ala Gly Val Ala Gln Val Asn Arg Asp Ser		
210	215	220
Val Asp Ala Val Thr Asp Arg Leu Pro Met Val Leu Gly Leu Ile Ala		
225	230	235
Ala Ile Thr Tyr Val Leu Leu Phe Leu Leu Thr Gly Ser Val Val Leu		
245	250	255

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Pro Ala Lys Ala Leu Val Cys Asn Val Leu Ser Leu Thr Ala Ala Phe
 260 265 270

Gly Ala Leu Val Trp Ile Phe Gln Glu Gly His Phe Gly Ala Leu Gly
 275 280 285

Thr Thr Pro Ser Gly Thr Leu Val Ala Asn Met Pro Val Leu Leu Phe
 290 295 300

Cys Ile Ala Phe Gly Leu Ser Met Asp Tyr Glu Val Phe Leu Val Ser
 305 310 315 320

Arg Ile Arg Glu Tyr Trp Leu Glu Ser Gly Ala Ala Arg Pro Ala Arg
 325 330 335

Arg Ser Val Ala Glu Val His Ala Ala Asn Asp Glu Ser Val Ala Leu
 340 345 350

Gly Val Ala Arg Thr Gly Arg Val Ile Thr Ala Ala Ala Leu Val Met
 355 360 365

Ser Met Ser Phe Ala Ala Leu Ile Ala Ala His Val Ser Phe Met Arg
 370 375 380

Met Phe Gly Leu Gly Leu Thr Leu Ala Val Ala Ala Asp Ala Thr Leu
 385 390 395 400

Val Arg Met Val Val Val Pro Ala Phe Met His Val Thr Gly Arg Trp
 405 410 415

Asn Trp Trp Ala Pro Arg Pro Leu Ala Trp Leu His Glu Arg Phe Gly
 420 425 430

Val Ser Glu Ala Ala Glu Pro Val Ser Arg Arg Arg Ser His Ala Gly
 435 440 445

Gly Leu Gly Lys Ile Ala Gly Arg Ser Asp Gly Gln Thr Ile Pro Ala
 450 455 460

Ser Leu Thr Arg Asn Gly
 465 470

-100-

<211> 1410

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 82

gtggctaccg tggcattcgt cgcgaccgcg tcgatcgtga tcaccccggc cgcgattgtg	60
ttgctaggtc ctccgctaga tgcgttggac gtgcgcgcac tgggtgcgtcg gctgctgggc	120
cggcccgatc cgggtgcacaa accggtcaag caactgttct ggtaccggtc gagcaagttc	180
gtgatgcgcc gttggctgcc ggtcggtagc gctgttgtcg cgctgctggg gctgctcggg	240
ctgccgttct tgtcggtgaa gtgggggttcc ccggacgacc ggggtgttgcc gcggtcggcg	300
tccgcccgtc aagtcggcga tatcttgccg gatgactttg gccacgatcc tgcgacgcag	360
atacccatcg tcgtcccga cgctcgtggg ctccggcccg tcgaacttga cagctacgca	420
gccgagttgt cccgggtgcc cgacgtatcc gcggtagccg ccccgacggg cacgttcgta	480
gacggcagct ggggtgggaac gccgcgcggg gccaccgggt tggctgaggg cagcgcgttc	540
ctgacggtga gcagcacggc gccgctgttt tcgcgagcct ccgatatcca gctcaagcgg	600
ttgcaccagg tggcagggcc ggccggtcga tccgtcgtga tggccgggtgt cgcgcaggtc	660
aaccgcgaca gtgtcgacgc ggtgaccgat cggcttccga tgggtgctagg gctaattgcc	720
gcgatcacct acgtactgtt gttcctgctc accggcagcg tgggtgctgcc ggcgaaagcg	780
ttggtttgta atgtgttatc gctgaccgcg gcgtttggcg cgttggtgtg gatcttccag	840
gaaggccatt tcggtgccct gggaacgact ccgagcggga cgttggtggc gaatatgccg	900
gtcctactgt tttgcatcgc attcggtttg tccatggact acgagggtgt tctgggtctcc	960
aggattcggg agtactgggt ggaatccgga gccgcgcgac ccgcgcgaag aagcgtcgca	1020
gaggtgcacg ccgccaacga cgagagcgtc gcgctcggcg tggcccgcac cggtcgggtg	1080
atcaccgcgg cagcgttggg gatgtccatg tcgttcgccg cgttgatcgc tgcgcacgtg	1140
tcgttcatgc ggatgttcgg cctcggcctg actttagccg tggctgcaga cgccacactg	1200
gtgcggatgg tcgtgggtccc agcattcatg catgtgacgg gccgctggaa ttgggtgggca	1260
ccgagacccc tggcgtggct gcatgagcgg ttcggtgtca gcgaggcagc agagccggtt	1320
tcgaggagac gttcccacgc cgggtgggtg ggcaagattg ccggacgaag cgacggtcag	1380
acgatccctg cctcgtgac gcgcaatggt	1410

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<210> 83

<211> 216

<212> PRT

<213> Mycobacterium tuberculosis

<400> 83

Met Thr Ser Gly Ala Ala Ala Ser Ala Ser Arg Val Asp His Pro Leu
 1 5 10 15

Phe Ala Arg Ile Trp Pro Val Val Ala Ala His Glu Ala Glu Ala Ile
 20 25 30

Arg Ala Leu Arg Arg Glu Asn Leu Ala Gly Leu Ser Gly Arg Val Leu
 35 40 45

Glu Val Gly Ala Gly Val Gly Thr Asn Phe Ala Tyr Tyr Pro Val Ala
 50 55 60

Val Glu Gln Val Ile Ala Met Glu Pro Glu Pro Arg Leu Ala Ala Lys
 65 70 75 80

Ala Arg Ile Ala Ala Ala Asp Ala Pro Val Pro Ile Val Val Thr Asp
 85 90 95

Lys Thr Val Glu Glu Phe Arg Asp Thr Glu Thr Phe Asp Ala Val Val
 100 105 110

Cys Ser Leu Val Leu Cys Ser Val Ser Asp Pro Gly Ala Val Leu Ala
 115 120 125

His Leu Arg Ser Leu Leu Arg Arg Gly Gly Glu Leu Arg Tyr Leu Glu
 130 135 140

His Val Ala Ser Ala Gly Ala Arg Gly Arg Val Gln Arg Phe Val Asp
 145 150 155 160

Ala Thr Phe Trp Pro Arg Leu Ala Gly Asn Cys His Thr His Arg His
 165 170 175

Thr Glu Arg Ala Ile Leu Asp Ala Gly Phe Val Val Asp Ser Ser Arg
 180 185 190

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Arg Glu Trp Ala Phe Pro Ala Trp Val Pro Leu Pro Val Ser Glu Leu
 195 200 205

Ala Leu Gly Arg Ala His Arg Thr
 210 215

<210> 84

<211> 648

<212> DNA

<213> Mycobacterium tuberculosis

<400> 84

atgacgtcag gcgcggccgc ttcggcgctcc agggctcgacc acccgctttt cgcccggatc 60
 tggcccgtgg tcgccgcaca cgaagccgaa gcaatacgag ccctccgccg ggagaatctg 120
 gccggtttgt cggggcggggt gttggaagtc ggggccggcg tcgggacgaa ctttgcttac 180
 tacccggtgg ccgtcgaaca ggtcatcgcc atggagcccg agccgcggct tgctgccaag 240
 gcccgcatcg cggccgctga cgcacccgtt ccgatagtcg tgacggacaa gacggtcgag 300
 gagttccgcg acaccgagac gtttgacgcg gtggtttgct cgctgggtgct gtgctcgggtg 360
 agcgaccccg gcgcgggtgct ggcgcacctg cgttcgctac tacggcgagg cggggagctg 420
 cgctatctcg agcatgtggc cagcgccggc gctcggggcc ggggtgcagcg gttcgtcgac 480
 gcgacatttt ggcccaggct ggccgggcaac tgtcacacgc atcgccatac cgaacgcgcg 540
 atcctcgacg ccggattcgt ggtggacagc tcccggcggg agtgggcatt tcccgcctgg 600
 gtgccgctac cgggtgtcaga gttggctctg ggccgcgcgc accggacc 648

<210> 85

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 85

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

-103-

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
 20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 86

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 86
 atgtcagggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtcgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccggt 120
 ctacttggtg ttggctgcgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac caccgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 87

<211> 489

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 87

Val Thr Asn Asp Leu Pro Asp Val Arg Glu Arg Asp Gly Gly Pro Arg
 1 5 10 15

Pro Ala Pro Pro Ala Gly Gly Pro Arg Leu Ser Asp Val Trp Val Tyr
 20 25 30

Asn Gly Arg Ala Tyr Asp Leu Ser Glu Trp Ile Ser Lys His Pro Gly
 35 40 45

Gly Ala Phe Phe Ile Gly Arg Thr Lys Asn Arg Asp Ile Thr Ala Ile
 50 55 60

Val Lys Ser Tyr His Arg Asp Pro Ala Ile Val Glu Arg Ile Leu Gln
 65 70 75 80

Arg Arg Tyr Ala Leu Gly Arg Asp Ala Thr Pro Arg Asp Ile His Pro
 85 90 95

Lys His Asn Ala Pro Ala Phe Leu Phe Lys Asp Asp Phe Asn Ser Trp
 100 105 110

Arg Asp Thr Pro Lys Tyr Arg Phe Asp Asp Pro Asn Asp Leu Leu His
 115 120 125

Arg Val Lys Ala Arg Leu Ala Glu Pro Ala Leu Ala Ala Arg Ile Lys
 130 135 140

Arg Met Asp Thr Leu Phe Asn Ala Ile Val Ala Val Leu Ala Val Gly
 145 150 155 160

Tyr Phe Ala Val Gln Gly Val Arg Leu Val Glu Pro Ser Trp Met Pro
 165 170 175

Leu Trp Ala Phe Val Ile Ala Met Val Leu Leu Arg Ser Ser Leu Ala
 180 185 190

Gly Phe Gly His Tyr Ala Leu His Arg Ala Gln Arg Gly Leu Asn Arg
 195 200 205

Val Phe Asn Asn Ala Phe Asp Leu Asn Tyr Val Ala Leu Ser Leu Val
 210 215 220

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Thr Ala Asp Gly His Thr Leu Leu His His Pro Tyr Thr Gln Ser Glu
 225 230 235 240

Val Asp Ile Lys Lys Asn Val Phe Thr Met Met Met Arg Leu Pro Trp
 245 250 255

Leu Tyr Arg Val Pro Val His Thr Ile His Lys Phe Gly His Met Leu
 260 265 270

Ser Gly Met Ala Ile Arg Ile Val Asp Val Phe Arg Ile Thr Arg Lys
 275 280 285

Val Gly Val Glu Glu Ser Tyr Gly Ser Trp Arg Ala Ala Leu Pro His
 290 295 300

Phe Leu Gly Ser Ala Gly Val Arg Leu Leu Leu Val Ser Glu Leu Val
 305 310 315 320

Val Phe Ala Ile Ala Gly Asp Phe Trp Pro Trp Ala Leu Gln Phe Val
 325 330 335

Ala Thr Leu Trp Val Ser Thr Phe Leu Val Val Ala Ser His Glu Phe
 340 345 350

Glu Asp Asp Thr Gln Gly Gly Ala Val Asn Gly Glu Asp Trp Gly Ile
 355 360 365

Asp Gln Leu Glu His Ala Asn Asp Leu Thr Val Ile Gly Asn Arg Tyr
 370 375 380

Val Asp Cys Phe Leu Ser Ala Gly Leu Ser Ser His Arg Val His His
 385 390 395 400

Val Leu Pro Phe Gln Arg Ser Gly Phe Ala Asn Ile Val Thr Glu Asp
 405 410 415

Val Leu Arg Glu Glu Ala Ala Lys Phe Gly Val Glu Trp Leu Pro Ala
 420 425 430

Lys Gly Phe Ile Thr Asp Arg Leu Pro Arg Leu Cys Arg Lys Tyr Leu
 435 440 445

Leu Thr Pro Ser Arg Gln Ala Lys Glu Arg His Trp Gly Phe Val Arg
 450 455 460

-106-

Glu His Cys Ser Pro Ala Ala Leu Lys Ala Ser Ala Ser Tyr Val Val
 465 470 475 480

Ala Gly Phe Val Gly Ile Gly Ser Val
 485

<210> 88

<211> 1467

<212> DNA

<213> Mycobacterium tuberculosis

<400> 88

gtgacaaacg acctcccaga cgtccgagag cgtgacggcg gtccacgtcc cgctcctcct 60
 gctggcgggc cacgcttgct agacgtgtgg gtttacaacg ggcgggcgta cgacctgagt 120
 gagtggattt ccaagcatcc cggcgggcgcc ttcttcattg ggcggaacaa gaaccgcgac 180
 atcacgcgaa tcgtcaagtc ctaccatcgt gatccggcga ttgtcgagcg aatcctgcag 240
 cggaggtacg cgttggggcg cgacgcaacc cctagggaca tccaccccaa gcacaatgca 300
 ccggcatttc tgttcaaaga cgacttcaac agctggcggg acaccccgaa gtatcgattc 360
 gacgacccca acgatctgct gcaccgggtc aaagcgcggc tagccgagcc agcgctggcc 420
 gcccgatca agcgcatgga cacactcttc aacgccatcg ttgcagtact ggccgtgggt 480
 tatttcgcgg ttcaggggtg gcggttggtg gaaccgagct ggatgccgct gtgggccttc 540
 gtgattgcga tggttctgct gcgcagttcg ttggccgggt tcggtcatta cgcactgcac 600
 cgcgcgcaac gaggcctcaa ccgggttttc aacaatgcct tcgatctcaa ctatgtggcc 660
 ttgtccttag tcaccgccga cggacacacc ctgctgcacc acccgatac ccagagcgag 720
 gtggacatca agaagaacgt gttcacgatg atgatgcggc taccgtgggt gtatcgcggt 780
 cccgtacata cgattcaciaa atttggccac atgctcagcg gcatggcgat ccggatcgtc 840
 gacgtcttca ggatcacgcg caaggtaggt gtcgaggaat cctacggaag ctggcgcgcc 900
 gcgcttcac acttccttgg atcggccggg gtgcgcttgc ttctgggtgag tgaattgggtg 960
 gtcttcgcga tcgccggcga cttctggccc tgggcactgc aattcgtagc gacgctgtgg 1020
 gttagtacct tcttgggtgt ggcgagccat gagttcgagg acgacacca gggcggtgcc 1080
 gtcaacggcg aggactgggg catagatcaa ctcgagcacg ctaatgacct aacggtgatc 1140

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gggaaccgct acgtcgactg cttcctgtca gccggcctga gctcccaccg agtccatcac 1200
 gtgctgccgt ttcagcgag cggttcgcg aacatcgta ccgaggacgt tttgcgtgag 1260
 gaagcagcga agttcgggtg cgagtggctt cccgcaaagg gtttcatcac cgatcggtg 1320
 ccgaggctgt gtcggaagta tctgttgacg ccgtcgcgcc aagccaagga gcgtcattgg 1380
 ggtttcgtcc gcgagcactg ctcgccggcg gcattgaaag ccagtgccag ctacgtgggt 1440
 gcgggtttcg tcggaatcgg gtcggta 1467

<210> 89

<211> 393

<212> PRT

<213> Mycobacterium tuberculosis

<400> 89

Met Asn Val Ser Ala Glu Ser Gly Ala Pro Arg Arg Ala Gly Gln Arg
 1 5 10 15

His Glu Val Gly Leu Ala Gln Leu Pro Pro Ala Pro Pro Thr Thr Val
 20 25 30

Ala Val Ile Glu Gly Leu Ala Thr Gly Thr Pro Arg Arg Val Val Asn
 35 40 45

Gln Ser Asp Ala Ala Asp Arg Val Ala Glu Leu Phe Leu Asp Pro Gly
 50 55 60

Gln Arg Glu Arg Ile Pro Arg Val Tyr Gln Lys Ser Arg Ile Thr Thr
 65 70 75 80

Arg Arg Met Ala Val Asp Pro Leu Asp Ala Lys Phe Asp Val Phe Arg
 85 90 95

Arg Glu Pro Ala Thr Ile Arg Asp Arg Met His Leu Phe Tyr Glu His
 100 105 110

Ala Val Pro Leu Ala Val Asp Val Ser Lys Arg Ala Leu Ala Gly Leu
 115 120 125

Pro Tyr Arg Ala Ala Glu Ile Gly Leu Leu Val Leu Ala Thr Ser Thr

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130		135		140
Gly Phe Ile Ala Pro Gly Val Asp Val Ala Ile Val Lys Glu Leu Gly				
145		150		155
				160
Leu Ser Pro Ser Ile Ser Arg Val Val Val Asn Phe Met Gly Cys Ala				
	165		170	175
Ala Ala Met Asn Ala Leu Gly Thr Ala Thr Asn Tyr Val Arg Ala His				
	180		185	190
Pro Ala Met Lys Ala Leu Val Val Cys Ile Glu Leu Cys Ser Val Asn				
	195		200	205
Ala Val Phe Ala Asp Asp Ile Asn Asp Val Val Ile His Ser Leu Phe				
	210		215	220
Gly Asp Gly Cys Ala Ala Leu Val Ile Gly Ala Ser Gln Val Gln Glu				
225		230		235
				240
Lys Leu Glu Pro Gly Lys Val Val Val Arg Ser Ser Phe Ser Gln Leu				
	245		250	255
Leu Asp Asn Thr Glu Asp Gly Ile Val Leu Gly Val Asn His Asn Gly				
	260		265	270
Ile Thr Cys Glu Leu Ser Glu Asn Leu Pro Gly Tyr Ile Phe Ser Gly				
	275		280	285
Val Ala Pro Val Val Thr Glu Met Leu Trp Asp Asn Gly Leu Gln Ile				
	290		295	300
Ser Asp Ile Asp Leu Trp Ala Ile His Pro Gly Gly Pro Lys Ile Ile				
305		310		315
				320
Glu Gln Ser Val Arg Ser Leu Gly Ile Ser Ala Glu Leu Ala Ala Gln				
	325		330	335
Ser Trp Asp Val Leu Ala Arg Phe Gly Asn Met Leu Ser Val Ser Leu				
	340		345	350
Ile Phe Val Leu Glu Thr Met Val Gln Gln Ala Glu Ser Ala Lys Ala				
	355		360	365

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<210> 91

<211> 326

<212> PRT

<213> Mycobacterium tuberculosis

<400> 91

Met Asn Ser Glu His Pro Met Thr Asp Arg Val Val Tyr Arg Ser Leu
 1 5 10 15

Met Ala Asp Asn Leu Arg Trp Asp Ala Leu Gln Leu Arg Asp Gly Asp
 20 25 30

Ile Ile Ile Ser Ala Pro Ser Lys Ser Gly Leu Thr Trp Thr Gln Arg
 35 40 45

Leu Val Ser Leu Leu Val Phe Asp Gly Pro Asp Leu Pro Gly Pro Leu
 50 55 60

Ser Thr Val Ser Pro Trp Leu Asp Gln Thr Ile Arg Pro Ile Glu Glu
 65 70 75 80

Val Val Ala Thr Leu Asp Ala Gln Gln His Arg Arg Phe Ile Lys Thr
 85 90 95

His Thr Pro Leu Asp Gly Leu Val Leu Asp Asp Arg Val Ser Tyr Ile
 100 105 110

Cys Val Gly Arg Asp Pro Arg Asp Ala Ala Val Ser Met Leu Tyr Gln
 115 120 125

Ser Ala Asn Met Asn Glu Asp Arg Met Arg Ile Leu His Glu Ala Val
 130 135 140

Val Pro Phe His Glu Arg Ile Ala Pro Pro Phe Ala Glu Leu Gly His
 145 150 155 160

Ala Arg Ser Pro Thr Glu Glu Phe Arg Asp Trp Met Glu Gly Pro Asn
 165 170 175

Gln Pro Pro Pro Gly Ile Gly Phe Thr His Leu Lys Gly Ile Gly Thr

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180	185	190
Leu Ala Asn Ile Leu His Gln Leu Gly Thr Val Trp Val Arg Arg His		
195	200	205
Leu Pro Asn Val Ala Leu Phe His Tyr Ala Asp Tyr Gln Ala Asp Leu		
210	215	220
Ala Gly Glu Leu Leu Arg Pro Ala Arg Val Leu Gly Ile Ala Ala Thr		
225	230	235 240
Arg Asp Arg Ala Arg Asp Leu Ala Gln Tyr Ala Thr Leu Asp Ala Met		
	245	250 255
Arg Ser Arg Ala Ser Glu Ile Ala Pro Asn Thr Thr Asp Gly Ile Trp		
	260	265 270
His Ser Asp Glu Arg Phe Phe Arg Arg Gly Gly Ser Gly Asp Trp Gln		
	275	280 285
Gln Phe Phe Thr Glu Ala Glu His Leu Arg Tyr Tyr His Arg Ile Asn		
	290	295 300
Gln Leu Ala Pro Pro Asp Leu Leu Ala Trp Ala His Glu Gly Arg Arg		
305	310	315 320
Gly Tyr Asp Pro Ala Asn		
	325	

<210> 92

<211> 978

<212> DNA

<213> Mycobacterium tuberculosis

<400> 92

atgaattcag aacacccgat gaccgaccgg gttgtgtatc gatcgttgat ggccgacaac	60
ctgcgatggg atgccctgca attgcgcgac ggcgacatca ttatctcggc gccgtccaag	120
agcggcctga cctggacaca gcgcctggtg tccctgctgg tgttcgacgg gcccgacttg	180
cccggaccct tgtcgacggg gtccccgtgg ctcgaccaga ccattcggcc catcgaggaa	240

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```

gtggtcgcta ctctcgatgc ccagcagcac cgccggttca tcaagacca cacgccgttg      300
gacggcctgg tgctcgacga ccgcgtcagc tacatctgcg taggacgcga cccgcgcgat      360
gccgcggtgt caatgctgta ccaatcggcc aacatgaacg aagaccggat gcggattctg      420
cacgaggccg tagtgccgtt tcacgagcga atcgcccccc cgtttgcgga actcgggtcat      480
gcgcgcagcc cgaccgagga gttccgggat tggatggagg ggccgaatca gcctccccct      540
ggcataggtt tcacacatct gaaggggatc ggcactctgg ccaacatcct gcaccagcta      600
ggcacggtat gggtcgcgcg tcacctaccc aacgtggcct tgtttcatta cgccgattac      660
caggcggact tggcgggcga gctgctccgg ccggcaaggg tcctcggtat cgccgcgacc      720
cgcgatcgag cccgggacct ggcgcagtac gccacgctgg atgcgatgcg ctcccgcgcg      780
tcagaaatcg ctctaacac caccgacggc atctggcaca gtgacgagcg tttcttccgc      840
cggggcgggg gtggcgactg gcagcagttc ttcaccgaag ccgagcacct gcgctactac      900
caccgcatca accagctggc gccacctgat ctgctggcct gggcacacga gggcgcgcgg      960
ggatacgacc cgccaac                                     978

```

<210> 93

<211> 422

<212> PRT

<213> Mycobacterium tuberculosis

<400> 93

```

Val Ala Glu Ala Gly Gly Gly Pro Ile Ser Val Ile Ala Arg His Met
1           5           10           15

```

```

Gln Leu Ile Arg Asp Asp Phe Ile Ser Glu Leu Phe Asp Lys Met Lys
          20           25           30

```

```

Ala Glu Ile Arg Gly Leu Asp Tyr Asp Ala Arg Met Ala Asp Leu Trp
35           40           45

```

```

Arg Ala Ser Ile Thr Glu Asn Phe Val Thr Ala Val His Tyr Leu Asp
50           55           60

```

```

Arg Asp Thr Pro Gln Ser Leu Val Glu Ala Pro Ala Ala Ala Leu Ala
65           70           75           80

```

Tyr Ala Arg Ala Ala Ala Gln Arg Asp Ile Pro Leu Ser Gly Leu Val
85 90 95

Ala Arg Pro Gly Gly Arg Val Met Phe Tyr Asp Asp Val Ala Pro Val
305 310 315 320

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Ala Leu Leu Ala Asp Asp Leu Glu Glu Leu Arg Arg Phe Val Thr Asp
 325 330 335

Val Leu Gly Asp Leu Ser Val Asp Asp Glu Arg Asn Ser Trp Leu Arg
 340 345 350

Glu Thr Leu Arg Glu Phe Leu Leu Arg Asn Arg Ser Tyr Val Ala Thr
 355 360 365

Ala Asp Ala Met Ile Leu His Arg Asn Thr Ile Gln Tyr Arg Val Ile
 370 375 380

Gln Ala Met Glu Leu Cys Gly Gln Asn Leu Asp Asp Pro Asp Ala Ala
 385 390 395 400

Phe Arg Val Gln Met Ala Leu Glu Val Cys Arg Trp Met Ala Pro Ala
 405 410 415

Val Leu Arg Ala Lys Gln
 420

<210> 94

<211> 1266

<212> DNA

<213> Mycobacterium tuberculosis

<400> 94

gtggctgaag ctgggtggcgg gccatttcg gtgatcgccc ggcatatgca gttgattcgc	60
gatgacttca tctccgagtt gtttgacaag atgaaggcgg agattcgggg gctggattac	120
gacgcgcgga tggcggacct gtggcgggcg agcatcaccg agaatttcgt gacggccggt	180
cactatttgg atcgcgatac gccgcagtcc ttggtggagg ctccagcggc cgcgctggca	240
tacgcccgcg ccgcggcgca gcgtgatatt ccgttgccg ggttggttcg ggcgaccg	300
ctcgggcatg cgcgtttctt ggaggtggcg atgcagtacg tgcgctgct ggagcccgt	360
gaccgggtgt cgacgatcat cgagctggtg aatcgctccg ctgcctcgt tgacctggtg	420
gccgaccagt tgattgtcgc ctatgagcac gaacacgac gctggctgag tcgccgcagc	480
ggtctgcaac agcaatgggt cagcgagctg ctgcgcgata ccccggtcga cgttccgcgg	540

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```

gccgagcgcg cggtgggcta tcggttgac ggtgtgcata tcgccgcggt ggtatgggtc   600
gattcggcgg tgcccatcgg tgatgtggtg ggcgaattcg accagggtgcg ctgcttgctg   660
gccggggagc tggggccccga actggggccc gtggcgaact cgctgatggt gccgaccgat   720
gagcgcgagg cacggctgtg gttttcgccc gcgcccacgc gggccttcgc cccgtcgcg   780
attcgcgcg cgttcgagtc ggcgggaatc cgggcgcggt tggcgtgcgg tcgggtaggg   840
gacgggctgc gtgggttcg ggcgtcgtt aaacaggccg aacgagtga ggcgttgcc   900
ctggccggtg gcgcccggcc cggcgccgg gtcatgtttt atgacgatgt cgcgccagtc   960
gcgttgctgg ccgacgatct agaggaactg cggcggttcg tcaccgatgt gctgggtgac  1020
ctgagtgttg acgacgagcg caatagctgg ctacgcgaga cgttacggga gttcttgctg  1080
cgtaaccgca gctacgtgc cacggccgac gcgatgatcc tgcaccgcaa caccattcaa  1140
taccgggtga tccaggcgat ggaactatgc ggacagaatc tcgacgatcc cgatgccgcg  1200
tttcgggtgc agatggcgct ggaggtctgc cgctggatgg caccggcggt gctccgcgcc  1260
aaacaa                                           1266

```

<210> 95

<211> 287

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 95

```

Met Lys Leu Ala Arg Pro Asp Val Phe His Pro Arg Val Val Leu Ala
1           5           10           15

```

```

Gly Trp Pro Gln Gln Pro Ala Gly Asp Gly Asp Asp Ala Gly Leu Val
          20           25           30

```

```

Ala Ala Leu Arg His Arg Gly Leu His Ala Gly Trp Leu Ser Trp Asp
          35           40           45

```

```

Asp Pro Glu Ile Val His Ala Asp Leu Val Ile Leu Arg Ala Thr Arg
          50           55           60

```

```

Asp Tyr Pro Ala Arg Leu Asp Glu Phe Leu Ala Trp Thr Thr Arg Val
65           70           75           80

```

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Ala Asn Leu Leu Asn Ser Arg Pro Val Val Ala Trp Asn Val Glu Arg
 85 90 95

Arg Tyr Leu Arg Asp Leu Met Asp Arg Gly Val Pro Thr Val Pro Gly
 100 105 110

Glu Val Tyr Val Pro Gly Glu Pro Val Arg Leu Pro Arg Lys Gly Gln
 115 120 125

Val Phe Val Gly Pro Thr Ile Gly Thr Gly Thr Arg Arg Cys Ser Ala
 130 135 140

Arg Phe Ala Ala Glu Phe Val Ala Gln Leu His Ala Ala Gly Gln Ala
 145 150 155 160

Val Leu Val Gln Pro Gly Gly Ser Gly Asp Glu Thr Val Leu Val Phe
 165 170 175

Leu Gly Gly Glu Pro Ser His Ala Phe Thr Lys Gln Ala Asp Thr Trp
 180 185 190

Arg Gln Thr Glu Pro Asp Phe Glu Ile Trp Asp Val Gly Ala Ala Ala
 195 200 205

Val Ala Gly Ala Ala Ala Gln Val Gly Val Asp Pro Gly Glu Leu Leu
 210 215 220

Tyr Ala Arg Ala His Ile Thr Gly Gly Ser Arg Asp Pro Arg Leu Leu
 225 230 235 240

Glu Leu Gln Leu Val Asp Pro Ser Leu Gly Trp Gln Trp Leu Asp Pro
 245 250 255

Asp Ile Arg Asn Leu Ala Gln Arg Asp Phe Ala Leu Cys Val Gln Ser
 260 265 270

Ala Leu Glu Arg Leu Gly Leu Gly Pro Phe Ser His Arg Arg Pro
 275 280 285

<210> 96

<211> 861

<212> DNA

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<213> Mycobacterium tuberculosis

<400> 96

```

atgaagcttg cccggccgga cgtcttccat ccgcgcgtcg ttttggcggg ttggccacag      60
cagcccgccg gtgacggcga cgatgctggg ctggttgcg ccctgcgcca ccgcggcttg      120
catgctgggtt ggctgtcttg ggacgatccc gaaatagtcc acgcggatct ggtgattttg      180
egggctaccc gcgattaccc cgcgcggctc gacgagtttt tggcctggac taccgcgctg      240
gccaatctgc tgaactcgcg gccggtgggt gcctggaatg tcgagcgccg ttacctacgt      300
gacctgatgg atcggggggt gccgacctg cccggcgagg tgtatgtgcc gggagagccg      360
gtccggttgc caccgaaagg ccaggtcttc gtccgtccga ccatcggtac cgggacacgg      420
cgctgtagtg cccggttcgc tgccgagttc gtccgcgaac tgcacgcggc cggccaggcg      480
gtgctcgttc agcccgagg ttccggtgac gagaccgtgt tggctcttct tggcgggtgag      540
ccgtcgcatg cgtttaccaa gcaggccgac acttggcgcc agaccgagcc cgacttcgaa      600
atctgggacg tgggtgcggc cgcctgggcc ggcgcggccg cgcaggtggg tgttgaccca      660
ggtgagctgc tctacgcgcg ggcccacatc acaggtggaa gccgagatcc ccggttgctg      720
gaattgcaat tgggtggaccc gtcgctgggc tggcagtggc tggaccaga catccgcaat      780
cttgcccagc gtgacttcgc gctatgcgtc cagtcagcgt tggagcggct ggggctgggc      840
ccgttctccc atcgacgcc a

```

861

<210> 97

<211> 280

<212> PRT

<213> Mycobacterium tuberculosis

<400> 97

```

Met Thr Asp Pro Phe Leu Gly Ser Glu Ala Leu Ala Ala Gly Val Leu
1           5           10           15

```

```

Thr Pro Tyr Glu Leu Arg Ser Arg Tyr Val Ala Leu His Lys Asp Val
20           25           30

```

```

Tyr Val Pro Gln Gly Val Glu Leu Thr Ala Gln Leu Arg Ala Lys Ala
35           40           45

```

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Leu Trp Leu Arg Ser Arg Arg Arg Gly Val Leu Ala Gly Tyr Ser Ala
 50 55 60

Ser Ala Phe His Gly Ala Lys Trp Ile Asp Ala Asp Leu Pro Ala Ala
 65 70 75 80

Ile Ile Asp Thr Asn Arg Arg Arg Ala Pro Gly Leu Gln Val Trp Glu
 85 90 95

Glu Arg Ile Glu Pro Asp Glu Ile Cys Val Ile Glu Gly Met Arg Val
 100 105 110

Thr Thr Pro Glu Arg Thr Ala Leu Asp Leu Thr Ser Arg Phe Pro Leu
 115 120 125

Asp Pro Ala Val Ala Ala Val Asp Ala Leu Ile Gln Ala Thr Asp Leu
 130 135 140

Lys Val Ala Asp Val Glu Pro Leu Ile Glu Arg Tyr Arg Gly Arg Arg
 145 150 155 160

Gly Met Lys Ala Ala Arg Ala Ala Leu Asp Leu Val Asp Gly Gly Ala
 165 170 175

Gln Ser Pro Lys Glu Thr Trp Leu Arg Leu Leu Leu Ile Arg Ala Gly
 180 185 190

Phe Pro Arg Pro Gln Thr Gln Ile Ala Val Arg Asn Glu Trp Gly Trp
 195 200 205

Ala Glu Ala His Leu Asp Met Gly Trp Gln Asp Ile Lys Val Ala Ala
 210 215 220

Glu Tyr Asp Gly Asp His His Leu Thr Ser Arg Tyr His Tyr Arg Lys
 225 230 235 240

Asp Ile Leu Arg His Glu Lys Val Gln His Arg Tyr Gly Trp Ile Val
 245 250 255

Val Arg Val Val Ala Glu Asp His Pro Ala Asp Ile Ile Arg Arg Val
 260 265 270

Gly Glu Ala Arg Ala Phe Arg Ala

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275

280

<210> 98

<211> 840

<212> DNA

<213> Mycobacterium tuberculosis

<400> 98

```

atgacggatc cctttctggg cagcgaggcc ctggctgcgg gtgtattgac gccctacgaa      60
ttgcgcagca ggtatgtcgc gctacataaa gacgtgtacg tgccgcaggg tgtggaactg      120
accgcgcaat tgcgtgcaaa agcgtgtggg ctgcgctcgc gccgccgcgg cgtgctggcc      180
ggctactcgg cttctgcctt ccatggcgcc aagtggatcg acgcggatct tcccgcgcgg      240
atcatcgaca ccaaccgccg ccgtgccccg gggctgcaag tctgggaaga gcgcacgcag      300
cccgacgaga tctgcgtcat cgagggcatg cgctgacca caccggagcg aacggcgctc      360
gacctgacca gtcgatttcc attggacccc gccgtcgcgg ccgtcgacgc cctgatacag      420
gccaccgatt tgaagggtggc cgacgtcgag ccgtgatcg agcgtatcg gggccgcgct      480
ggcatgaagg ccgcaagagc cgctctggac ctgcgcgacg gcggtgcccc gtcccccaag      540
gaaacctggc tgcgcttgtt gttgatccgc gccggctttc cgcgccccca gacgcagatc      600
gcggtgcgca acgaatgggg ctgggcggaa gccatttgg atatgggctg gcaagacatc      660
aaggtcgcgg ccgagtatga cggcgaccac catctgacca gtcgctacca ctaccggaaa      720
gacatcctcc ggcacgagaa agtccagcac cgctacgggt ggatcgtggt ccgggtcgtc      780
gccgaggacc accccgctga catcatccgc cgctggggcg aggccgcgc tttccgagcg      840

```

<210> 99

<211> 334

<212> PRT

<213> Mycobacterium tuberculosis

<400> 99

```

Met Met Ala Ala Ser His Asp Asp Asp Thr Val Asp Gly Leu Ala Thr
1           5           10           15

```

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Ala Val Arg Gly Gly Asp Arg Ala Ala Leu Pro Arg Ala Ile Thr Leu
20 25 30

Val Glu Ser Thr Arg Pro Asp His Arg Glu Gln Ala Gln Gln Leu Leu
35 40 45

Leu Arg Leu Leu Pro Asp Ser Gly Asn Ala His Arg Val Gly Ile Thr
50 55 60

Gly Val Pro Gly Val Gly Lys Ser Thr Ala Ile Glu Ala Leu Gly Met
65 70 75 80

His Leu Ile Glu Arg Gly His Arg Val Ala Val Leu Ala Val Asp Pro
85 90 95

Ser Ser Thr Arg Thr Gly Gly Ser Ile Leu Gly Asp Lys Thr Arg Met
100 105 110

Ala Arg Leu Ala Val His Pro Asn Ala Tyr Ile Arg Pro Ser Pro Thr
115 120 125

Ser Gly Thr Leu Gly Gly Val Thr Arg Ala Thr Arg Glu Thr Val Val
130 135 140

Leu Leu Glu Ala Ala Gly Phe Asp Val Ile Leu Ile Glu Thr Val Gly
145 150 155 160

Val Gly Gln Ser Glu Val Ala Val Ala Asn Met Val Asp Thr Phe Val
165 170 175

Leu Leu Thr Leu Ala Arg Thr Gly Asp Gln Leu Gln Gly Ile Lys Lys
180 185 190

Gly Val Leu Glu Leu Ala Asp Ile Val Val Val Asn Lys Ala Asp Gly
195 200 205

Glu His His Lys Glu Ala Arg Leu Ala Ala Arg Glu Leu Ser Ala Ala
210 215 220

Ile Arg Leu Ile Tyr Pro Arg Glu Ala Leu Trp Arg Pro Pro Val Leu
225 230 235 240

Thr Met Ser Ala Val Glu Gly Arg Gly Leu Ala Glu Leu Trp Asp Thr
245 250 255

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Val Glu Arg His Arg Gln Val Leu Thr Gly Ala Gly Glu Phe Asp Ala
 260 265 270

Arg Arg Arg Asp Gln Gln Val Asp Trp Thr Trp Gln Leu Val Arg Asp
 275 280 285

Ala Val Leu Asp Arg Val Trp Ser Asn Pro Thr Val Arg Lys Val Arg
 290 295 300

Ser Glu Leu Glu Arg Arg Val Arg Ala Gly Glu Leu Thr Pro Ala Leu
 305 310 315 320

Ala Ala Gln Gln Ile Leu Glu Ile Ala Asn Leu Thr Asp Arg
 325 330

<210> 100

<211> 1002

<212> DNA

<213> Mycobacterium tuberculosis

<400> 100

atgatggccg catcccacga cgacgacacc gtcgacgggt tggcgacggc cgtgcgcggc 60
 ggtgaccgtg cggcgctgcc acgggccatc aactgggtcg agtcgacccg ccccgaccat 120
 cgtgagcagg cgcaacagct gctgctgcca ttgctgccgg actccgggaa cgcccatcgc 180
 gtcggcatca ccgggggtccc ggggggtggc aagtcgactg ccatcgaggc gctgggcatg 240
 catctgatcg agcgcgggca tcgggtggcg gtgctggcgg tcgacccgtc gtcgacccgc 300
 acgggtggat cgattcttgg tgataaaacc cggatggcgc ggctggcggt gcacccgaac 360
 gcctacatcc ggccgtcccc gacgtcggga acgctgggtg gggtgacgag ggccacccgg 420
 gaaacggtgg tgctgttga ggcggccggt tttgatgtga tcctgatcga aaccgtcggg 480
 gtgggcccagt ccgaggtcgc ggtggccaac atggtcgaca cgttcgtgtt gctgaccttg 540
 gcccgacccg gtgatcagtt gcagggcatc aagaagggcg tgctggagct cgccgacatc 600
 gtggtggtga acaaggccga cggggagcac cacaagagg cccggctggc cgcccgggag 660
 ctgtcggcgg cgatcagatt gatctatcct cgcgaagcac tgtggcgccc accggtgctc 720
 accatgagcg cgggtggaggg caggggactg gccgagctgt gggacaccgt cgagcgtcat 780

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cgccaggtgc tcaccggggc cggcgaattc gacgcccgtc ggcgcgatca gcaggtegac 840
 tggacctggc agctgggttcg cgacgccgtc ctggatcggg tgtgggtccaa tccgacgggtg 900
 cgcaaggtcc gctccgagct cgagcgtcgg gtccgcgccg gcgaactgac cccggccctg 960
 gcggctcagc aaatactgga gatagctaac ctaacggata gg 1002

<210> 101

<211> 426

<212> PRT

<213> Mycobacterium tuberculosis

<400> 101

Met Lys Phe Val Leu Ala Val His Gly Thr Arg Gly Asp Val Glu Pro
 1 5 10 15

Cys Ala Ala Val Gly Val Glu Leu Arg Arg Arg Gly His Ala Val His
 20 25 30

Met Ala Val Pro Pro Asn Leu Ile Glu Phe Val Glu Ser Ala Gly Leu
 35 40 45

Thr Gly Val Ala Tyr Gly Pro Asp Ser Asp Glu Gln Ile Asn Thr Val
 50 55 60

Ala Ala Phe Val Arg Asn Leu Thr Arg Ala Gln Asn Pro Leu Asn Leu
 65 70 75 80

Ala Arg Ala Val Lys Glu Leu Phe Val Glu Gly Trp Ala Glu Met Gly
 85 90 95

Thr Thr Leu Thr Thr Leu Ala Asp Gly Ala Asp Leu Val Met Thr Gly
 100 105 110

Gln Thr Tyr His Gly Val Ala Ala Asn Val Ala Glu Tyr Tyr Asp Ile
 115 120 125

Pro Ala Ala Ala Leu His His Phe Pro Met Gln Val Asn Gly Gln Ile
 130 135 140

Ala Ile Pro Ser Ile Pro Thr Pro Ala Thr Leu Val Arg Ala Thr Met

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145	150	155	160
Lys Val Ser Trp Arg Leu Tyr Ala Tyr Val Ser Lys Asp Ala Asp Arg	165	170	175
Ala Gln Arg Arg Glu Leu Gly Leu Pro Pro Ala Pro Ala Pro Ala Val	180	185	190
Arg Arg Leu Ala Glu Arg Gly Ala Pro Glu Ile Gln Ala Tyr Asp Pro	195	200	205
Val Phe Phe Pro Gly Leu Ala Ala Glu Trp Ser Asp Arg Arg Pro Phe	210	215	220
Val Gly Pro Leu Thr Met Glu Leu His Ser Glu Pro Asn Glu Glu Leu	225	230	235
Glu Ser Trp Ile Ala Ala Gly Thr Pro Pro Ile Tyr Phe Gly Phe Gly	245	250	255
Ser Thr Pro Val Gln Thr Pro Val Gln Thr Leu Ala Met Ile Ser Asp	260	265	270
Val Cys Ala Gln Leu Gly Glu Arg Ala Leu Ile Tyr Ser Pro Ala Ala	275	280	285
Asn Ser Thr Arg Ile Arg His Ala Asp His Val Lys Arg Val Gly Leu	290	295	300
Val Asn Tyr Ser Thr Ile Leu Pro Lys Cys Arg Ala Val Val His His	305	310	315
Gly Gly Ala Gly Thr Thr Ala Ala Gly Leu Arg Ala Gly Met Pro Thr	325	330	335
Leu Ile Leu Trp Asp Val Ala Asp Gln Pro Ile Trp Ala Gly Ala Val	340	345	350
Gln Arg Leu Lys Val Gly Ser Ala Lys Arg Phe Thr Asn Ile Thr Arg	355	360	365
Gly Ser Leu Leu Lys Glu Leu Arg Ser Ile Leu Ala Pro Glu Cys Ala	370	375	380

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Ala Arg Ala Arg Glu Ile Ser Thr Arg Met Thr Arg Pro Thr Ala Ala
 385 390 395 400

Val Thr Ala Ala Ala Asp Leu Leu Glu Ala Thr Ala Arg Gln Thr Pro
 405 410 415

Gly Ser Thr Pro Ser Ser Ser Pro Gly Arg
 420 425

<210> 102

<211> 1278

<212> DNA

<213> Mycobacterium tuberculosis

<400> 102

atgaagtttg tcttggcggg ccacggaacc cgcggtgatg tcgaaccttg cgccgcgggt 60
 ggcgtggagc tgcggcgggc aggccacgca gttcatatgg cagtgccgcc caacctgac 120
 gagttcgctc agtcggcagg tctgaccggc gtcgcctacg gcccgactc ggacgaacag 180
 atcaacacgg tcgcggcatt cgtccgcaac ctcaccagag ccagaaatcc gctcaacctc 240
 gcccgcgccg tcaaggaact attcgctgaa ggctgggagg agatgggcac gacgttgacc 300
 acgttgggcg acggcgccga cctgggtgatg acgggcccaga catatcatgg tgtggcagcc 360
 aacgtcgccg agtactacga cattccggct gcggcactgc atcactttcc gatgcaggctc 420
 aacggccaaa tcgcgatccc gtcgataccg acgcccggca ctctggtgcg cgcgacgatg 480
 aaggctcat ggcggtgta tgcgtacgtc agcaaggatg ccgatcgcg gcaacgacgt 540
 gaactgggccc taccgccagc accggcgccg gcggtgctc ggctggcgga acgcgagcg 600
 cccgaaatcc aagcctacga cccggttttt ttccccggac tggcggccga atggagcgac 660
 cgccgcccgt ttgtcggccc gctgaccatg gagttacaca gcgaacccaa cgaagaactc 720
 gagtcgtgga tcgccgccg aacaccaccc atctacttcg gcttcggcag cacgcccgtc 780
 caaacgcccg tccaaacgct cgccatgatc tccgatgtct gcgcacagct cggcgagcga 840
 gccctgatct attctccggc agccaactcc acccgcatc gtcatgccga ccacgtgaaa 900
 cgtgtcggcc tggtaacta ttcgaccatc cttcccaagt gccgcgagg cgtccaccac 960
 ggtggcgccg gtaccaccgc cgccggcctg cgagcgggaa tgcccacgct gattctctgg 1020
 gacgtggccg atcaaccgat ctgggcccgg gccgtccaac gactcaaagt cggctctgcc 1080

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aaacgcttta cgaacatcac ccgcgggtca ttgctcaagg agctacgata gatcctggcg 1140
 ccggaatgcg ccgcgcgggc acgtgagata tcgacacgga tgacccggcc gacagccgcc 1200
 gtcaccgagg ccgcggacct gctggaggcg acggcacgcc aaacgcctgg gagcacgcct 1260
 agcagctcgc cgggcagg 1278

<210> 103

<211> 165

<212> PRT

<213> Mycobacterium tuberculosis

<400> 103

Val Thr Gln Leu Pro Gln Pro Thr Trp Arg Trp Trp Gln Gln Arg Glu
 1 5 10 15

Thr Glu Gln Val Gln Ser Ser His Ile Asp Gly Glu Ile Val Gly Ala
 20 25 30

Leu Ile Pro Asp Leu Ala Val Leu His Ser Glu Asp Ala Ser Arg Ala
 35 40 45

Ala Val Gly Arg Glu Lys His Arg Cys Ser Leu Asp Pro Leu Gly Gly
 50 55 60

Gly Phe Arg Ser Arg Arg Ala Ser Met Pro Ala Gly Ala Leu Leu Leu
 65 70 75 80

Ser Ala Val Ile Ala Ile Gln Leu Asp Arg Met Asn Ala Arg Val Phe
 85 90 95

Gly Asp Gly Trp Ile Gly Ala Gln Ala Cys Met Trp Val Asn Lys Phe
 100 105 110

His Glu Glu Ser Thr Val Thr Ala Leu Ser Pro Ser Ser Pro Ile Ala
 115 120 125

Gln Gly Ser Ile Ala Arg His Pro Glu Thr Met Gln Ser Ala Tyr Val
 130 135 140

Arg Ile Ala Glu Gly Gly Ser Arg Asp Val Ala Pro Ala Ala Gln Leu

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145

150

155

160

Gln Arg Arg Arg Pro
165

<210> 104

<211> 495

<212> DNA

<213> Mycobacterium tuberculosis

<400> 104

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gtgactcagc ttccacaacc aacctggcgc tgggtggcagc aaagagagac ggagcaggtg      60
cagtccagcc acatcgacgg agaaatagtc ggcgcggttga tccctgacct ggcggtgctg      120
cacagcgagg atgcctcacg cgcggccgtg ggaagggaaa agcatagatg ctcgttggat      180
cctctaggtg gcggtctccg ttcccgctgt gcctcgatgc cggccggcgc gcttctgctg      240
tctgcggtca tcgcaataca actggaccgg atgaatgcca gagtattcgg cgatggctgg      300
atcggcgcgc aagcgtgcat gtgggtcaac aagtttcacg aggagagcac cgtcaccgcg      360
ttgtccccc a gtagtccgat cgcgcagggc tcgatcgcgc ggcattccaga gacgatgcaa      420
tcggcgtagc tgcgcatcgc cgagggcgga tcgcgcgatg tcgccccagc cgcccagctt      480
cagcgacgac ggcct                                     495

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<210> 105

<211> 583

<212> PRT

<213> Mycobacterium tuberculosis

<400> 105

Met Thr Ala Gln His Asn Ile Val Val Ile Gly Gly Gly Gly Ala Gly
1 5 10 15

Leu Arg Ala Ala Ile Ala Ile Ala Glu Thr Asn Pro His Leu Asp Val
20 25 30

Ala Ile Val Ser Lys Val Tyr Pro Met Arg Ser His Thr Val Ser Ala

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35

40

45

Glu Gly Gly Ala Ala Ala Val Thr Gly Asp Asp Asp Ser Leu Asp Glu
 50 55 60

His Ala His Asp Thr Val Ser Gly Gly Asp Trp Leu Cys Asp Gln Asp
 65 70 75 80

Ala Val Glu Ala Phe Val Ala Glu Ala Pro Lys Glu Leu Val Gln Leu
 85 90 95

Glu His Trp Gly Cys Pro Trp Ser Arg Lys Pro Asp Gly Arg Val Ala
 100 105 110

Val Arg Pro Phe Gly Gly Met Lys Lys Leu Arg Thr Trp Phe Ala Ala
 115 120 125

Asp Lys Thr Gly Phe His Leu Leu His Thr Leu Phe Gln Arg Leu Leu
 130 135 140

Thr Tyr Ser Asp Val Met Arg Tyr Asp Glu Trp Phe Ala Thr Thr Leu
 145 150 155 160

Leu Val Asp Asp Gly Arg Val Cys Gly Leu Val Ala Ile Glu Leu Ala
 165 170 175

Thr Gly Arg Ile Glu Thr Ile Leu Ala Asp Ala Val Ile Leu Cys Thr
 180 185 190

Gly Gly Cys Gly Arg Val Phe Pro Phe Thr Thr Asn Ala Asn Ile Lys
 195 200 205

Thr Gly Asp Gly Met Ala Leu Ala Phe Arg Ala Gly Ala Pro Leu Lys
 210 215 220

Asp Met Glu Phe Val Gln Tyr His Pro Thr Gly Leu Pro Phe Thr Gly
 225 230 235 240

Ile Leu Ile Thr Glu Ala Ala Arg Ala Glu Gly Gly Trp Leu Leu Asn
 245 250 255

Lys Asp Gly Tyr Arg Tyr Leu Gln Asp Tyr Asp Leu Gly Lys Pro Thr
 260 265 270

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Pro Glu Pro Arg Leu Arg Ser Met Glu Leu Gly Pro Arg Asp Arg Leu
 275 280 285

Ser Gln Ala Phe Val His Glu His Asn Lys Gly Arg Thr Val Asp Thr
 290 295 300

Pro Tyr Gly Pro Val Val Tyr Leu Asp Leu Arg His Leu Gly Ala Asp
 305 310 315 320

Leu Ile Asp Ala Lys Leu Pro Phe Val Arg Glu Leu Cys Arg Asp Tyr
 325 330 335

Gln His Ile Asp Pro Val Val Glu Leu Val Pro Val Arg Pro Val Val
 340 345 350

His Tyr Met Met Gly Gly Val His Thr Asp Ile Asn Gly Ala Thr Thr
 355 360 365

Leu Pro Gly Leu Tyr Ala Ala Gly Glu Thr Ala Cys Val Ser Ile Asn
 370 375 380

Gly Ala Asn Arg Leu Gly Ser Asn Ser Leu Pro Glu Leu Leu Val Phe
 385 390 395 400

Gly Ala Arg Ala Gly Arg Ala Ala Ala Asp Tyr Ala Ala Arg His Gln
 405 410 415

Lys Ser Asp Arg Gly Pro Ser Ser Ala Val Arg Ala Gln Ala Arg Thr
 420 425 430

Glu Ala Leu Arg Leu Glu Arg Glu Leu Ser Arg His Gly Gln Gly Gly
 435 440 445

Glu Arg Ile Ala Asp Ile Arg Ala Asp Met Gln Ala Thr Leu Glu Ser
 450 455 460

Ala Ala Gly Ile Tyr Arg Asp Gly Pro Thr Leu Thr Lys Ala Val Glu
 465 470 475 480

Glu Ile Arg Val Leu Gln Glu Arg Phe Ala Thr Ala Gly Ile Asp Asp
 485 490 495

His Ser Arg Thr Phe Asn Thr Glu Leu Thr Ala Leu Leu Glu Leu Ser
 500 505 510

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Gly Met Leu Asp Val Ala Leu Ala Ile Val Glu Ser Gly Leu Arg Arg
 515 520 525

Glu Glu Ser Arg Gly Ala His Gln Arg Thr Asp Phe Pro Asn Arg Asp
 530 535 540

Asp Glu His Phe Leu Ala His Thr Leu Val His Arg Glu Ser Asp Gly
 545 550 555 560

Thr Leu Arg Val Gly Tyr Leu Pro Val Thr Ile Thr Arg Trp Pro Pro
 565 570 575

Gly Glu Arg Val Tyr Gly Arg
 580

<210> 106

<211> 1749

<212> DNA

<213> Mycobacterium tuberculosis

<400> 106

atgaccgccc aacacaacat cgtgggttatac ggcggcggtg gtgcgggtct gcgcgccgcg	60
attgcgatag ccgaaaccaa tccgcacctg gatgtggcga tcgtttccaa ggtgtacccg	120
atgcgcagcc acaccgtctc ggctgagggc ggcgccgcgg cggtgaccgg tgacgacgac	180
agcctcgatg aacacgcgca cgacacggtc tccggtggcg actggctgtg tgaccaagat	240
gcggtcgagg ctttcgtggc cgaggcgccc aaagagttgg tgcagctcga gcattggggc	300
tgtccgtgga gccgtaaacc agacgggcgc gttgccgttc gcccgttcgg cgggatgaag	360
aagctgcgca cctgggtttgc cgccgacaag acgggatttc acctcctgca cacgttggtt	420
caacggctgc tcacctattc cgacgtcatg cgctatgacg agtggttcgc tacgacgctg	480
ctggctgacg acggcagggc atgtggtctg gtcgctatcg agttggcgac cgggcgcac	540
gagacgatcc ttgccgacgc ggtgattctg tgcaccggcg gatgcgggcg ggtatttcca	600
ttcaccacca acgcgaacat caagaccggc gacggcatgg cgctcgcatt ccgcgcgggc	660
gcgcccctaa aagacatgga attcgtccaa taccaccca ccgactgcc gttcaccggg	720
atcttgatca ccgaggccgc acgagctgaa ggcggctggc tgctcaacaa agacggctac	780

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cgctacctcc aggattacga cctcggcaag cccacgcccg agcccaggct gcgcagtatg 840
 gagctcgggc ccagggaccg actgtcgcag gccttcgtac acgagcacaa caaaggaagg 900
 acggtcgaca ccccgtagcg ccccgtcgtc tatctagacc tgcggcacct gggggcggac 960
 ctgatcgatg caaagttgcc gttcgtacgt gagctgtgcc gcgactacca gcacatcgac 1020
 cccgtggtcg aattggtccc ggtacgaccg gtagtgact acatgatggg tggcgttcac 1080
 accgatatca acggcgccac aacgcttccc gggctatatg ccgcagggtga aacagcctgc 1140
 gtgagcatta atggcgccaa ccgcctgggg tcgaactcgc tgcccagagct gctggtgttc 1200
 ggggctcgag cgggccgtgc cgccgcggat tacgcagcgc gccacaaaaa gtcggaccgt 1260
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 ttcaacaccg agctgactgc gctgctcgag ttgtcgggga tgctcgacgt tgcactggcg 1560
 atcgtcgaat cgggtttgcg ccgagaagaa tcccgtggcg cacaccagcg aaccgacttt 1620
 ccgaaccggg acgacgagca tttcttggcg cacaccttgg ttcatagaga aagcgacgga 1680
 acgctgcggg tcggctacct tccggtcact atcactcgct ggccaccggg cgaacgcgtg 1740
 tatgggagg 1749

<210> 107

<211> 386

<212> PRT

<213> Mycobacterium tuberculosis

<400> 107

Met Lys Ala Ala Thr Gln Ala Arg Ile Asp Asp Ser Pro Leu Ala Trp
 1 5 10 15

Leu Asp Ala Val Gln Arg Gln Arg His Glu Ala Gly Leu Arg Arg Cys
 20 25 30

Leu Arg Pro Arg Pro Ala Val Ala Thr Glu Leu Asp Leu Ala Ser Asn
 35 40 45

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Asp Tyr Leu Gly Leu Ser Arg His Pro Ala Val Ile Asp Gly Gly Val
 50 55 60

Gln Ala Leu Arg Ile Trp Gly Ala Gly Ala Thr Gly Ser Arg Leu Val
 65 70 75 80

Thr Gly Asp Thr Lys Leu His Gln Gln Phe Glu Ala Glu Leu Ala Glu
 85 90 95

Phe Val Gly Ala Ala Ala Gly Leu Leu Phe Ser Ser Gly Tyr Thr Ala
 100 105 110

Asn Leu Gly Ala Val Val Gly Leu Ser Gly Pro Gly Ser Leu Leu Val
 115 120 125

Ser Asp Ala Arg Ser His Ala Ser Leu Val Asp Ala Cys Arg Leu Ser
 130 135 140

Arg Ala Arg Val Val Val Thr Pro His Arg Asp Val Asp Ala Val Asp
 145 150 155 160

Ala Ala Leu Arg Ser Arg Asp Glu Gln Arg Ala Val Val Val Thr Asp
 165 170 175

Ser Val Phe Ser Ala Asp Gly Ser Leu Ala Pro Val Arg Glu Leu Leu
 180 185 190

Glu Val Cys Arg Arg His Gly Ala Leu Leu Leu Val Asp Glu Ala His
 195 200 205

Gly Leu Gly Val Arg Gly Gly Gly Arg Gly Leu Leu Tyr Glu Leu Gly
 210 215 220

Leu Ala Gly Ala Pro Asp Val Val Met Thr Thr Thr Leu Ser Lys Ala
 225 230 235 240

Leu Gly Ser Gln Gly Gly Val Val Leu Gly Pro Thr Pro Val Arg Ala
 245 250 255

His Leu Ile Asp Ala Ala Arg Pro Phe Ile Phe Asp Thr Gly Leu Ala
 260 265 270

Pro Ala Ala Val Gly Ala Ala Arg Ala Ala Leu Arg Val Leu Gln Ala
 275 280 285

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Glu Pro Trp Arg Pro Gln Ala Val Leu Asn His Ala Gly Glu Leu Ala
 290 295 300

Arg Met Cys Gly Val Ala Ala Val Pro Asp Ser Ala Met Val Ser Val
 305 310 315 320

Ile Leu Gly Glu Pro Glu Ser Ala Val Ala Ala Ala Ala Ala Cys Leu
 325 330 335

Asp Ala Gly Val Lys Val Gly Cys Phe Arg Pro Pro Thr Val Pro Ala
 340 345 350

Gly Thr Ser Arg Leu Arg Leu Thr Ala Arg Ala Ser Leu Asn Ala Gly
 355 360 365

Glu Leu Glu Leu Ala Arg Arg Val Leu Thr Asp Val Leu Ala Val Ala
 370 375 380

Arg Arg
 385

<210> 108

<211> 1158

<212> DNA

<213> Mycobacterium tuberculosis

<400> 108

atgaaagccg ccacgcaggc acggatcgac gattcacctg tggcctgggt ggacgcgggtg 60
 cagcggcagc gccacgaggc cggactgcgg cgctgcctgc ggccgcgtcc cgcggtcgcc 120
 accgagctgg acttggcctc caacgactat ctcggtctgt cccgacatcc cgccgtcatc 180
 gacggcggcg tccaggcgct gcggatctgg ggcgccggcg ccaccgggtc gcgcctgggt 240
 accggcgaca ccaagctgca ccagcaattc gaggccgagc tcgccgagtt cgtcggcgct 300
 gccgcgggat tgctgttctc ctctggctac acggccaacc tgggcgccgt ggtcggcctg 360
 tccggccccg gttccctgct ggtgtccgac gcccgttcgc atgcgtcggt ggtggatgcc 420
 tgtcggctgt cgcgggcgcg ggttgtggtg acgccgcacc gcgacgtcga cgccgtggac 480
 gccgcgctgc gatcgcgca cgagcagcgc gccgtcgctc tcaccgactc ggtgttcagc 540

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gccgacggct cgctggcgcc ggttcgggag ttgcttgagg tctgccggcg tcatggtgcg      600
ctgcttcttg tggacgaggc gcacggcctg ggtgtgcgtg gcggcggacg cgggctgctc      660
tacgagttag gtctagcggg tgcgcccgcac gtggtgatga ccaccacgct gtccaaggcg      720
ctgggcagcc aggggtggtgt ggtgctcggg ccgacgccgg tgcgggcccac tctgatcgat      780
gctgcccggc cgttcattctt cgacaccggt ctggcgccgg cggcgggtggg tgccgcacgg      840
gccgcgctgc gcgtcttgca ggccgagccg tggcgaccgc aggcgggtgct caaccacgct      900
ggtgaacttg cgcggatgtg cgggtgtggct gcggtgccgg actcggcgat ggtgtcgggtg      960
atcctggggc agccggagtc ggcagtggcc gccgcggcgg cctgcctgga cgccgggggtc     1020
aagggtgggt gcttcgggcc gccgacggtg cccgcgggta cgtcgcggct gcggctgacc     1080
gcgcgcgcac cgctgaacgc cggcgagctc gagctggccc ggcggggtgct gacggatggt     1140
ctcgccgtgg cgcgccgt
                                                                 1158

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<210> 109

<211> 136

<212> PRT

<213> Mycobacterium tuberculosis

<400> 109

```

Met Thr Thr Thr Pro Ala Arg Phe Asn His Leu Val Thr Val Thr Asp
1              5              10              15

Leu Glu Thr Gly Asp Arg Ala Val Cys Asp Arg Asp Gln Val Ala Glu
                20              25              30

Thr Ile Arg Ala Trp Phe Pro Asp Ala Pro Leu Glu Val Arg Glu Ala
          35              40              45

Leu Val Arg Leu Gln Ala Ala Leu Asn Arg His Glu His Thr Gly Glu
          50              55              60

Leu Glu Ala Phe Leu Arg Ile Ser Val Glu His Ala Asp Ala Ala Gly
65              70              75              80

Gly Asp Glu Cys Gly Pro Ala Ile Leu Ala Gly Arg Ser Gly Pro Glu
          85              90              95

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Gln Ala Ala Ile Asn Arg Gln Leu Gly Leu Ala Gly Asp Asp Glu Pro
 100 105 110

Asp Gly Asp Asp Thr Pro Pro Trp Ser Arg Met Ile Gly Leu Gly Gly
 115 120 125

Gly Ser Pro Ala Glu Asp Glu Arg
 130 135

<210> 110

<211> 408

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 110
 atgaccacca caccagcacg tttcaaccac ttggtgacgg taaccgacct ggaaacgggt 60
 gaccgcgccg tctgcgaccg cgaccaggtg gccgagacga tccgggcggtg gttcccggac 120
 gcgccccttg aggtgagggg agcgctcggt cggtgcagg ccgcgttgaa tcggcacgag 180
 cacaccggcg agctcgaagc gttcctgcgg atcagcgtcg agcacgccga cgcgcgccgc 240
 ggcgacgagt gcggcccggc gatcctggcc ggccgctccg ggccggaaca agccgccatc 300
 aaccggcaac tcggactcgc cggcgacgac gagcccgacg gcgacgacac cccgccgtgg 360
 agccggatga tcgggcttgg cggcggaagc ccagcggaag acgagcgc 408

<210> 111

<211> 170

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 111

Met Ala Glu Leu Arg Ser Gly Glu Gly Arg Thr Val His Gly Thr Ile
 1 5 10 15

Val Pro Tyr Asn Glu Ala Thr Thr Val Arg Asp Phe Asp Gly Glu Phe
 20 25 30

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Gln Glu Met Phe Ala Pro Gly Ala Phe Arg Arg Ser Ile Ala Glu Arg
 35 40 45

Gly His Lys Leu Lys Leu Leu Val Ser His Asp Ala Arg Thr Arg Tyr
 50 55 60

Pro Val Gly Arg Ala Val Glu Leu Arg Glu Glu Pro His Gly Leu Phe
 65 70 75 80

Gly Ala Phe Glu Ile Ala Asp Thr Pro Asp Gly Asp Glu Ala Leu Ala
 85 90 95

Asn Val Lys Ala Gly Val Val Asp Ser Phe Ser Val Gly Phe Arg Pro
 100 105 110

Ile Arg Asp Arg Arg Glu Gly Asp Val Leu Val Arg Val Glu Ala Ala
 115 120 125

Leu Leu Glu Val Ser Leu Thr Gly Val Pro Ala Tyr Ser Gly Ala Gln
 130 135 140

Ile Ala Gly Val Arg Ala Glu Ser Leu Thr Val Val Ser Arg Ser Thr
 145 150 155 160

Ala Glu Ala Trp Leu Ser Leu Leu Asp Trp
 165 170

<210> 112

<211> 510

<212> DNA

<213> Mycobacterium tuberculosis

<400> 112

atggccgagc tgcggtctgg cgaaggccga accgtgcacg gcaccatcgt gccctacaac	60
gaggcgacca ccgtccgcga cttcgacggc gagttccagg aaatgttcgc tcctggcgct	120
tttcggcgct ccacgcccga gcgcggccac aaattgaagc tgctggtctc tcacgacgct	180
cgaaccgcgt acccggtggg ccgggcccgtt gagttgcggg aggagcctca cggcttggtc	240
ggggcgttcg agattgcgga caccgccgac ggcgacgagg ctttggcgaa cgtaaaagct	300
ggtgtcgtcg actcgttttc ggtgggtttc cgaccgatcc gggaccgtcg cgaaggggat	360

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gtgctgggtgc gcgtcgaagc ggcgctgtta gaggtttccc taaccggcgt tccggcctat 420
 tcgggggcac aaatcgccgg ggtgcgcgcg gaatcgctta cagtcgtttc ccgttcgaca 480
 gccgaagcct ggctgtccct actcgattgg 510

<210> 113

<211> 115

<212> PRT

<213> Mycobacterium tuberculosis

<400> 113

Met Ile Arg Ala Val Trp Asn Gly Thr Val Leu Ala Glu Ala Pro Arg
 1 5 10 15

Thr Val Arg Val Glu Gly Asn His Tyr Phe Pro Pro Glu Ser Leu His
 20 25 30

Arg Glu His Leu Ile Glu Ser Pro Thr Thr Ser Ile Cys Pro Trp Lys
 35 40 45

Gly Leu Ala His Tyr Tyr Asn Val Val Val Asp Gly Pro Tyr Gly Pro
 50 55 60

Val Asn Pro Asp Ala Ala Trp Tyr Tyr Arg Arg Pro Ser Pro Leu Ala
 65 70 75 80

Arg Arg Ile Lys Asn His Val Ala Phe Trp His Gly Val Thr Val Glu
 85 90 95

Gly Glu Ser Glu Ser Arg His Gly Leu Ala Arg Arg Val Val Ala Trp
 100 105 110

Leu Gly Lys
 115

<210> 114

<211> 345

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 114

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atgattcgtg ctgtgtggaa tggaacagtg ctcgctgagg cgccgcgaac cgtacgggtg      60
gaaggcaacc actactttcc gcccgagtcg ctgcaccgcg agcatctaata cgaaagcccg      120
accacgtcga tatgcccattg gaaggggtctg gccccattact acaacgtcgt cgtggacggc      180
ccctatgggtc cggttaaccc ggacgctgcc tgggtactacc gccggcccag tccactgggt      240
cgccggatca aaaaccatgt tgcgttctgg cacgggtgtga cggtcgaagg tgaatccgag      300
agtcggcatg gcttggcgcg ccgggttggtg gcgtggctcg gcaaaa                        345

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<210> 115

<211> 236

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 115

```

Val Gln Pro Tyr Gly Gln Tyr Cys Pro Val Ala Arg Ala Ala Glu Leu
1              5              10              15

Leu Gly Asp Arg Trp Thr Leu Leu Ile Val Arg Glu Leu Leu Phe Gly
                20              25              30

Pro Leu Arg Phe Thr Glu Ile Glu Arg Gly Leu Pro Gly Ile Ser Arg
35              40              45

Ser Val Leu Ala Gln Arg Leu Arg Arg Leu Gln His Asp Arg Ile Ile
50              55              60

Glu Ala Val Pro Glu His Thr Gly Gly Gly Tyr Arg Phe Thr Val Ala
65              70              75              80

Gly Glu Glu Leu Arg Pro Val Leu Gln Thr Leu Gly Asp Trp Val Ser
85              90              95

Arg Trp Leu Met Ala Asp Pro Thr Pro Ala Glu Cys Asp Pro Glu Leu
100             105             110

Leu Thr Leu Trp Ile Ser Arg Arg Val Asn Thr Glu Ala Leu Pro Gly
115             120             125

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Arg Arg Val Val Val Glu Phe Arg Tyr His Gly Glu Arg Pro Leu Trp
 130 135 140

Ala Trp Leu Val Leu Glu Pro Gly Asp Ile Ser Val Cys Leu His Asp
 145 150 155 160

Pro Cys Leu Pro Val Asp Leu Thr Val Arg Gly His Pro Arg Asp Leu
 165 170 175

Tyr Arg Val Tyr Ser Gly Arg Ser Thr Leu Ala Ala Glu Ile Ser Ala
 180 185 190

Glu Arg Ile Glu Leu Asp Gly Leu Pro Ala Met Arg Arg Ala Phe Pro
 195 200 205

Ser Trp Met Ala Trp Ser Pro Phe Ala Pro Ala Met Arg Gln Ala Val
 210 215 220

Val Ser Val Asp Gln Met Pro Glu Ala His Gly Gly
 225 230 235

<210> 116

<211> 708

<212> DNA

<213> Mycobacterium tuberculosis

<400> 116

gtgcagccgt acggccagta ctgcccggta gcgcgggcgg cggagctgct gggggaccgc 60
 tggacgctgc taatcgtgcg ggagctgctc ttcggcccgc tgcggttcac cgaaatcgag 120
 cggggcctgc ccggcatctc ccgctcgggtg ctggcccagc ggctacgccg acttcagcac 180
 gaccgcatca tcgaagcggg ccccgaaacac acgggcgggg gctatcgggt caccgtggcc 240
 ggcgaggagc tacgccccgt gctgcagacc ctgggggact ggggtctccc ttggttgatg 300
 gccgacccca ctcccgccga atgcgacccc gaactactca cgttgtggat ctcccggcgc 360
 gtcaacaccg agggccttcc cggccggcgg gtggtggtgg agttccgcta ccacggcgag 420
 cggccactgt gggcctgggt cgtgttgga cctggggaga tctcgggtgtg cctgcacgat 480
 ccatgcctac ctgtcgacct caccgtgcgc ggccatcctc gagatctgta tcgggtctac 540

-139-

agcggccgca gcacactggc cgccgagatc tccgccgagc gcatcgaact ggacggcctg 600
 ccggcgatgc ggcgcgcgtt cccatcctgg atggcttgga gtcccttcgc cccagccatg 660
 cggcaagccg tgggtgccgt agaccagatg ccggaggctc atggtggg 708

<210> 117

<211> 517

<212> PRT

<213> Mycobacterium tuberculosis

<400> 117

Leu Cys Pro Pro Ile Ile Leu Ser Ser Ala Thr Pro Thr Gly Thr Arg
 1 5 10 15

Cys Gly Thr Arg His Gly Arg Ala Val Val Thr Glu Tyr Val Arg Ala
 20 25 30

Leu Asp Arg Leu Pro His Glu Ile Ala Thr Ala Val Val Glu Thr Val
 35 40 45

Asn Cys Ala Asp Pro Gly Ala Ala Phe Asp Glu Leu Asp Ala Lys Ile
 50 55 60

Asn Ala Gly Met Lys Ala Tyr Ala Ile Pro Gly Val Ala Val Ala Val
 65 70 75 80

Trp Ala Gly Gly Gln Glu Tyr Val Lys Gly Tyr Gly Val Thr Asn Val
 85 90 95

Asp His Pro Met Pro Val Asp Gly Asp Thr Val Phe Arg Ile Gly Ser
 100 105 110

Thr Thr Lys Thr Phe Thr Gly Thr Val Met Met Arg Leu Val Glu Arg
 115 120 125

Gly Lys Val Asp Leu Asp Ser Pro Val Arg Arg Tyr Ile Pro Asp Phe
 130 135 140

Ala Val Ala Asp Glu Ser Ala Ser Ala Thr Val Thr Val Arg Gln Leu
 145 150 155 160

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Leu Asn His Thr Ala Gly Trp Asp Gly Arg Asn Gly Gln Asp Phe Gly
 165 170 175

Arg Gly Asp Asp Ala Val Ala Leu Tyr Val Lys Ala Met Thr Arg Leu
 180 185 190

Pro Gln Leu Thr Pro Pro Gly Thr Ala Phe Ala Tyr Asn Asn Ser Gly
 195 200 205

Leu Val Val Ala Gly Arg Ile Ile Glu Leu Val Ala Gly Thr Thr Tyr
 210 215 220

Glu Ser Thr Val Gln Arg Leu Leu Leu Asp Pro Leu Gln Leu Ala His
 225 230 235 240

Thr Arg Tyr Phe Ser Asp Gln Ile Ile Gly Leu Asn Val Ala Ala Ser
 245 250 255

His Ser Val Val Asp Gly Lys Pro Ile Ala Val Thr Asp Phe Trp Thr
 260 265 270

Phe Pro Arg Ser Cys Asn Pro Thr Gly Gly Leu Met Ser Thr Ala Arg
 275 280 285

Asp Gln Leu Arg Tyr Ala Gln Phe His Leu Gly Asp Gly Arg Ala Pro
 290 295 300

Asn Gly Glu Gln Ile Leu Ser Arg Gln Ser Leu Lys Ala Met Arg Ser
 305 310 315 320

Asn Pro Gly Ala Gly Gly Thr Leu Trp Val Glu Leu Thr Gly Met Gly
 325 330 335

Val Thr Trp Met Leu Arg Pro Ser Ala Glu Asn Val Thr Ile Val Glu
 340 345 350

His Gly Gly Thr Trp Lys Gly Gln Arg Ser Gly Phe Val Met Val Pro
 355 360 365

Asp Arg Asn Phe Ala Met Thr Val Leu Thr Asn Ser Asp Gly Gly Phe
 370 375 380

His Met Ile Asn Asp Leu Phe Ala Ser Asp Trp Ala Leu Gln Arg Phe
 385 390 395 400

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Ala Gly Leu Ser Asn Leu Pro Ala Thr Pro Gln Arg Leu Gly Ala Val
 405 410 415

Asp Leu Ala Pro Tyr Glu Gly Arg Tyr Ile Ala Lys Gln Val Ala Gln
 420 425 430

Asn Gly Asp Leu Glu Thr Thr Val Ile Asp Phe Arg Ala Arg Asp Gly
 435 440 445

Gln Leu Ala Gly Ser Met Ser Thr Asp Asp Ala Asn Pro Asp Gly Gln
 450 455 460

Asn Ser Ala Asn Leu Gly Leu Ala Phe Tyr Arg Pro Asp Tyr Gly Leu
 465 470 475 480

Asp Leu Gly Pro Asp Asn Lys Pro Thr Gly Ser Arg Ser Asn Phe Val
 485 490 495

Arg Gly Pro Asp Gly Asn Ile Ala Trp Phe Cys Ser Gln His Gly Arg
 500 505 510

Leu Phe Arg Arg Gln
 515

<210> 118

<211> 1551

<212> DNA

<213> Mycobacterium tuberculosis

<400> 118

ttgtgtccgc cgatcatctt gagttccgcg acgccgaccg gcacgcggtg cgggacgcgc	60
catggggcgcg cggtcgtcac cgaatacgtg cgtgcgctag atcgactgcc gcacgaaatc	120
gccactgcag tggttgaaac tgtcaactgc gcagaccctg gtgcagcggt cgacgaactc	180
gatgcaaaaa tcaacgcggg catgaaggcc tatgcgattc cgggcgtcgc gggtgctgtc	240
tgggcgggcg ggcaagaata cgtcaaaggc tacgggggtca ccaatgtcga ccatccgatg	300
cctgttgacg gcgacactgt cttcagaatc gggtccacca caaagacttt cacaggtacg	360
gtgatgatgc ggctggtcga gcgaggcaag gtggacctgg attcacctgt gcgccgctac	420

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```

atccccgact tcgcggttagc cgacgaatca gccagcgcta cggttaccgt tcgccaactg      480
ctcaaccata ccgcaggctg ggatggtcgc aatgggcagg actttgggcg cggcgatgac      540
gcggtggcgc tctatgtcaa ggcatgaca cgcctaccgc agctcacccc tccgggaacc      600
gcgttcgcgt acaacaattc aggtcttctg gttgcgggcc gcacatcga gcttgctgcc      660
ggaacaacct acgaatctac ggttcagagg ctgttgcttg acccgctgca gcttgctcac      720
acgcgctact tttccgacca aataatcggc ctgaatgtgg ccgcatcgca tagcgtggtc      780
gacggcaaac cgattgccgt tactgacttt tggacattcc cgcgcagctg caaccccacc      840
ggtgggttga tgtccacagc gcgagatcag ctgcgttacg cacagttcca cctcggcgac      900
ggcagggcgc ctaacgggtga gcagattctg agccgacaat cgctgaaggc aatgcgctct      960
aaccctgggg cgggcggaac actttgggtg gaactgaccg ggatgggcgt gacctggatg     1020
ctgcggccct ccgcggagaa tgtgaccatc gttgagcacg gcggcacctg gaaggggcag     1080
cgctctgggt tcgtcatggt gcccgatcga aacttcgcca tgaccgtgct cactaactct     1140
gatggcggat ttcatatgat caacgacctt ttgcgcatcg actgggcatt gcagagattc     1200
gccgggctca gcaatcttcc ggccacgccg caacgccttg gtgccgtcga cctggcgccc     1260
tacgagggcc ggtacatcgc caagcaagtc gcccaaatg gcgacctcga gacaacggtc     1320
atcgacttcc gggccaggga cggccagctt gctggaagca tgagcaccga cgatgccaac     1380
ccggatggcc aaaacagcgc caatctgggc ctgccttct atcgggccga ctatgggctc     1440
gaccttggac ccgacaacaa gccaccggc agtcgctcca acttcgtgcg cgggccggac     1500
ggcaacatcg cctggttctg tagccagcac ggccgtctgt tccgacgcca a              1551

```

<210> 119

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 119

```

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
1           5           10           15

```

```

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
          20           25           30

```

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Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 120

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 120

atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtcgcagaga tccgcgggtca gcacgattcg gaggggcag cgatcagtga ggtcgcccgt 120
 ctacttggtg ttggtgctgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac caccgacgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 121

<211> 365

<212> PRT

<213> Mycobacterium tuberculosis

<400> 121

Met Ser Ser Thr Ala Thr Ser Gly Ala Ala Val Val Ser Pro Ala Glu
 1 5 10 15

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Arg Val Glu Val Leu Phe Glu Glu Leu Ala Glu Leu Ala Gly Gln Arg
 20 25 30

Asn Ala Ile Asp Gly Arg Ile Val Glu Ile Val Ala Glu Leu Asp Arg
 35 40 45

Asp Gly Leu Trp Gly Val Thr Gly Ala Arg Ser Val Ala Gly Leu Val
 50 55 60

Ala Trp Lys Met Gly Cys Ser Ser Gly Asn Ala His Thr Ile Ala Thr
 65 70 75 80

Val Ala Arg Arg Leu Pro Glu Phe Pro Arg Cys Ala Arg Gly Met Arg
 85 90 95

Glu Gly Arg Leu Ser Leu Asp Gln Val Gly Val Ile Ala Gly Arg Ala
 100 105 110

Gly Glu Gly Ser Asp Ala His Tyr Ala Gln Leu Ala Gly Val Ala Thr
 115 120 125

Val Asn Gln Leu Arg Thr Ala Leu Lys Leu Glu Pro Arg Pro Glu Pro
 130 135 140

Glu Pro Asp Phe Arg Pro Glu Pro Arg Pro Ser Ile Thr Arg Ser Ala
 145 150 155 160

Asp Glu Gln Phe Ser Cys Trp Arg Ile Lys Leu Pro His Val Glu Ala
 165 170 175

Ala Lys Phe Asp Ala Ala Leu Gln Ser His Leu Asp Ala Leu Ile Ala
 180 185 190

Glu Tyr Lys Arg Asp His Asp Asn Ser Asp Gly Val Ser Asp Gln Arg
 195 200 205

Pro Pro Leu Pro Gly Asn Val Glu Ala Phe Leu Arg Leu Val Glu Ala
 210 215 220

Gly Trp Asp Ala Glu Val Ala Arg Arg Pro His Gly Gln His Thr Thr
 225 230 235 240

Val Val Met His Leu Asp Val Gln Glu Arg Ala Ala Gly Leu His Leu

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245	250	255
Gly Pro Leu Leu Ser Glu Ser Glu Arg Arg Tyr Leu Leu Cys Asp Ala		
260	265	270
Thr Phe Glu Ala Trp Phe Glu Arg Asp Gly Gln Val Ile Gly Cys Gly		
275	280	285
Arg Thr Thr Arg Gln Ile Asn Arg Arg Leu Arg Arg Ala Leu Glu His		
290	295	300
Arg Asp Arg Thr Cys Val Val Pro Gly Cys Gly Ala Thr Arg Gly Leu		
305	310	315
		320
His Ala His His Ile Arg His Trp Gln Asp Gly Gly Ala Thr Glu Leu		
325	330	335
Ala Asn Leu Val Leu Val Cys Pro Tyr His His Arg Ala His His Arg		
340	345	350
Gly Leu Asn Arg Pro Gly Glu Ser Gly Asp Ser Leu Ile		
355	360	365

<210> 122

<211> 1095

<212> DNA

<213> Mycobacterium tuberculosis

<400> 122

atgtcctcga ccgcgacgtc tggcgcagcg gtagtcagtc ctgccgagcg tgtggaggtg	60
ttgtttgagg agttggcgga gttggccggt cagcgcaatg cgattgatgg gcgcattgtg	120
gagatcgtgg ctgagctgga tcgcgacggg ttgtgggggtg tgacggggggc gcggtcggtg	180
gcgggggttg tggcctggaa gatgggctgc tcgtcaggca acgcccacac gatcgccacg	240
gtggcgcggc gggttgcgga gtttccgcgc tgcgcccggg gtatgcggga ggggcggttg	300
tcgttgatc aggttggggt gatcgcgggg cgggcgggtg agggttcgga tgcgcattat	360
gcgcagttgg ccggcggttc caccgtgaat cagctgcgga ccgcgctcaa gttggaaccg	420
cgaccgaac ccgaaccgga ttttcggccg gaaccgcggc cctcgatcac caggagcgcc	480

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```

gatgagcagt tcagttgttg gcgaatcaag cttccgcacg tggaggcggc gaagttcgat      540
gcgggcgttg agtctcatct ggatgcgttg atcgccgagt acaagcgtga tcacgacaac      600
agcgacggtg tgcgggatca gcggcccccg ttgccgggca atgttgaggc gtttctgcgt      660
ctggttgagg ccggctggga cgccgagggtg gtcgctcggc cacatgggca gcacaccacc      720
gtggtgatgc atctagacgt gcaggagcgt gccgctggcc tgcacctggg tccgctgctc      780
agcgagtcctg aacgccgata tctgctctgt gatgccacct ttgaggcctg gtttgaacgt      840
gacgggcagg tcattggctg cggtcgaacg actcgtcaga tcaatcgtcg gttgcgtcgt      900
gcgcttgagc atcgcgaccg cacgtgtgtg gttcccgggt gtggggccac ccgggggttg      960
cacgcccacc acatccgaca ttggcaggac ggtggggcca ccgagctggc caacctggtg     1020
ctggtgtgcc cgtatcacca ccgggcacac catcggggcc tgaaccgccc cggtgagtc      1080
ggagactctc tgatc                                     1095

```

<210> 123

<211> 434

<212> PRT

<213> Mycobacterium tuberculosis

<400> 123

```

Val Arg Arg Ser Pro Lys Gly Ser Pro Gly Ala Val Leu Asp Leu Gln
1           5           10           15

```

```

Arg Arg Val Asp Gln Ala Val Ser Ala Asp His Ala Glu Leu Met Thr
          20           25           30

```

```

Ile Ala Lys Asp Ala Asn Thr Phe Phe Gly Ala Glu Ser Val Gln Asp
          35           40           45

```

```

Pro Tyr Pro Leu Tyr Glu Arg Met Arg Ala Ala Gly Ser Val His Arg
          50           55           60

```

```

Ile Ala Asn Ser Asp Phe Tyr Ala Val Cys Gly Trp Asp Ala Val Asn
65           70           75           80

```

```

Glu Ala Ile Gly Arg Pro Glu Asp Phe Ser Ser Asn Leu Thr Ala Thr
          85           90           95

```

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Met Thr Tyr Thr Ala Glu Gly Thr Ala Lys Pro Phe Glu Met Asp Pro
 100 105 110

Leu Gly Gly Pro Thr His Val Leu Ala Thr Ala Asp Asp Pro Ala His
 115 120 125

Ala Val His Arg Lys Leu Val Leu Arg His Leu Ala Ala Lys Arg Ile
 130 135 140

Arg Val Met Glu Gln Phe Thr Val Gln Ala Ala Asp Arg Leu Trp Val
 145 150 155 160

Asp Gly Met Gln Asp Gly Cys Ile Glu Trp Met Gly Ala Met Ala Asn
 165 170 175

Arg Leu Pro Met Met Val Val Ala Glu Leu Ile Gly Leu Pro Asp Pro
 180 185 190

Asp Ile Ala Gln Leu Val Lys Trp Gly Tyr Ala Ala Thr Gln Leu Leu
 195 200 205

Glu Gly Leu Val Glu Asn Asp Gln Leu Val Ala Ala Gly Val Ala Leu
 210 215 220

Met Glu Leu Ser Gly Tyr Ile Phe Glu Gln Phe Asp Arg Ala Ala Ala
 225 230 235 240

Asp Pro Arg Asp Asn Leu Leu Gly Glu Leu Ala Thr Ala Cys Ala Ser
 245 250 255

Gly Glu Leu Asp Thr Leu Thr Ala Gln Val Met Met Val Thr Leu Phe
 260 265 270

Ala Ala Gly Gly Glu Ser Thr Ala Ala Leu Leu Gly Ser Ala Val Trp
 275 280 285

Ile Leu Ala Thr Arg Pro Asp Ile Gln Gln Gln Val Arg Ala Asn Pro
 290 295 300

Glu Leu Leu Gly Ala Phe Ile Glu Glu Thr Leu Arg Tyr Glu Pro Pro
 305 310 315 320

Phe Arg Gly His Tyr Arg His Val Arg Asn Ala Thr Thr Leu Asp Gly
 325 330 335

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Thr Glu Leu Pro Ala Asp Ser His Leu Leu Leu Leu Trp Gly Ala Ala
 340 345 350

Asn Arg Asp Pro Ala Gln Phe Glu Ala Pro Gly Glu Phe Arg Leu Asp
 355 360 365

Arg Ala Gly Gly Lys Gly His Ile Ser Phe Gly Lys Gly Ala His Phe
 370 375 380

Cys Val Gly Ala Ala Leu Ala Arg Leu Glu Ala Arg Ile Val Leu Arg
 385 390 395 400

Leu Leu Leu Asp Arg Thr Ser Val Ile Glu Ala Ala Asp Val Gly Gly
 405 410 415

Trp Leu Pro Ser Ile Leu Val Arg Arg Ile Glu Arg Leu Glu Leu Ala
 420 425 430

Val Gln

<210> 124

<211> 1302

<212> DNA

<213> Mycobacterium tuberculosis

<400> 124

```

gtgagacgtt cgccgaaagg ctccccgggc gcagttctcg acttgcagcg acgcgttgac      60
caggcggtat ccgccgatca cgctgaacta atgacaattg ccaaggatgc caacacgttc      120
tttggtgccg aatccgtgca ggacccctac ccgctgtatg agcgcacgcg cgccgcaggc      180
tcggtccacc ggatcgctaa ctcggaacttc tatgccgtgt gcggttgagg cgctgtcaat      240
gaggccatcg gtcgtccgga ggactttctcc tcgaatttga ccgccacgat gacctatacg      300
gccgagggca ccgctaaacc gttcgagatg gaccactcgc gcggaccac acacgtgttg      360
gccaccgcgc acgatcctgc ccacgccgtg caccgcaagc tcgtgctgcg tcacttggcg      420
gccaagcgga tccgcgttat ggagcagttc accgtacagg ctgccgaccg gctgtgggtc      480
gacggcatgc aggatgggtg catcgaatgg atggggcgcca tggccaatcg cctaccgatg      540

```

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```

atggtcgtag ctgagctcat cggcctgccc gaccccgaca tcgcccagct ggtgaagtgg      600
ggatacgcgg ccactcagct actcgaaggg ttggtcgaaa acgatcagct cgtcgccgcg      660
ggtgtggcgt tgatggagct cagcggttac atcttcgagc agtttgaccg tgccgcggcc      720
gatccgcggg acaatctgct cggtagctt gccaccgcct gcgcatcggg ggagctggac      780
actctcaccg ccaggtcat gatggtcacc ttgttcgccg ccggcggcga gtccacggcg      840
gcgctgctgg gcagcgcggt atggatactg gcgacacgtc ccgatatcca gcaacaggtg      900
cgcgcaacc ccgagctgct gggagcgttt atcgaagaga cgctgcgtta cgagccgcca      960
tttcgcggcc actaccgcca cgtgcgaaac gccaccacct tggacggcac ggaactgccc     1020
gcggattcgc acctgctgct gttgtggggc gcggccaacc gcgatccagc ccagttcgag     1080
gcacccggcg agttccgtct tgaccgtgca ggaggcaaag gccacatcag tttcgaaaaa     1140
ggggcccact tctgtgtcgg cgctgcactg gcacgcttgg aggctcgaat cgtcttgctg     1200
ctgctgctcg atcgcacctc ggtaattgag gcagccgatg tcggcgggtg gttgccagct     1260
atcctggtgc gccgcatcga gcggctagag ctagctgtac aa                          1302

```

<210> 125

<211> 99

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 125

```

Met Ala Phe Val Leu Val Cys Pro Asp Ala Leu Ala Ile Ala Ala Gly
1          5          10          15

```

```

Gln Leu Arg His Val Gly Ser Val Ile Ala Ala Arg Asn Ala Val Ala
20          25          30

```

```

Ala Pro Ala Thr Ala Glu Leu Ala Pro Ala Ala Ala Asp Glu Val Ser
35          40          45

```

```

Ala Leu Thr Ala Thr Gln Phe Asn Phe His Ala Ala Met Tyr Gln Ala
50          55          60

```

```

Val Gly Ala Gln Ala Ile Ala Met Asn Glu Ala Phe Val Ala Met Leu
65          70          75          80

```

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Gly Ala Ser Ala Asp Ser Tyr Ala Ala Thr Glu Ala Ala Asn Ile Ile
 85 90 95

Ala Val Ser

<210> 126

<211> 297

<212> DNA

<213> Mycobacterium tuberculosis

<400> 126

atggcggttg ttcttgtctg tccagatgcg ctggccatcg cggccggtca gttgcgcat 60
 gttggatcgg tgatagccgc gcggaatgcg gtcgcggcac cggcaactgc cgaattggcc 120
 ccggcgggcg ctgacgaagt atcagctttg actgcaacac aattcaactt ccatgcggcc 180
 atgtaccaag cggtcggcgc ccaggcgatc gccatgaatg aggcgttcgt cgcgatgttg 240
 ggcgccagcg cggattctta cgcggctacc gaagccgcca acatcattgc tgtgagc 297

<210> 127

<211> 778

<212> PRT

<213> Mycobacterium tuberculosis

<400> 127

Met Val Thr Arg Leu Leu Ala Asp Leu Gly Ala Asp Val Leu Lys Val
 1 5 10 15

Glu Pro Pro Gly Gly Ser Pro Gly Arg His Val Arg Pro Thr Leu Ala
 20 25 30

Gly Thr Ser Ile Gly Phe Ala Met His Asn Ala Asn Lys Arg Ser Ala
 35 40 45

Val Leu Asn Pro Leu Asp Glu Ser Asp Arg Arg Arg Phe Leu Asp Leu
 50 55 60

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Ala Ala Ser Ala Asp Ile Val Val Asp Cys Gly Leu Pro Gly Gln Ala
 65 70 75 80

Ala Ala Tyr Gly Ala Ser Cys Ala Glu Leu Ala Asp Arg Tyr Arg His
 85 90 95

Leu Val Ala Leu Ser Ile Thr Asp Phe Gly Ala Ala Gly Pro Arg Ser
 100 105 110

Ser Trp Arg Ala Thr Asp Pro Val Leu Tyr Ala Met Ser Gly Ala Leu
 115 120 125

Ser Arg Ser Gly Pro Thr Ala Gly Thr Pro Val Leu Pro Pro Asp Gly
 130 135 140

Ile Ala Ser Ala Thr Ala Ala Val Gln Ala Ala Trp Ala Val Leu Val
 145 150 155 160

Ala Tyr Phe Asn Arg Leu Arg Cys Gly Thr Gly Asp Tyr Ile Asp Phe
 165 170 175

Ser Arg Phe Asp Ala Val Val Met Ala Leu Asp Pro Pro Phe Gly Ala
 180 185 190

His Gly Gln Val Ala Ala Gly Ile Arg Ser Thr Gly Arg Trp Arg Gly
 195 200 205

Arg Pro Lys Asn Gln Asp Ala Tyr Pro Ile Tyr Pro Cys Arg Asp Gly
 210 215 220

Tyr Val Arg Phe Cys Val Met Ala Pro Arg Gln Trp Arg Gly Leu Arg
 225 230 235 240

Arg Trp Leu Gly Glu Pro Glu Asp Phe Gln Asp Pro Lys Tyr Asp Val
 245 250 255

Ile Gly Ala Arg Leu Ala Ala Trp Pro Gln Ile Ser Val Leu Val Ala
 260 265 270

Lys Leu Cys Ala Glu Lys Thr Met Lys Glu Leu Val Ala Ala Gly Gln
 275 280 285

Ala Leu Gly Val Pro Ile Thr Ala Val Leu Thr Pro Ser Arg Ile Leu
 290 295 300

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Ala Ser Glu His Phe Gln Ala Val Gly Ala Ile Thr Asp Ala' Glu Leu
 305 310 315 320

Val Pro Gly Val Arg Thr Gly Val Pro Thr Gly Tyr Phe Val Val Asp
 325 330 335

Gly Lys Arg Ala Gly Phe Arg Thr Pro Ala Pro Ala Ala Gly Gln Asp
 340 345 350

Glu Pro Arg Trp Leu Ala Asp Pro Ala Pro Val Pro Pro Pro Ser Gly
 355 360 365

Arg Val Gly Gly Tyr Pro Phe Glu Gly Leu Arg Ile Leu Asp Leu Gly
 370 375 380

Ile Ile Val Ala Gly Gly Glu Leu Ser Arg Leu Phe Gly Asp Leu Gly
 385 390 395 400

Ala Glu Val Ile Lys Val Glu Ser Ala Asp His Pro Asp Gly Leu Arg
 405 410 415

Gln Thr Arg Val Gly Asp Ala Met Ser Glu Ser Phe Ala Trp Thr His
 420 425 430

Arg Asn His Leu Ala Leu Gly Leu Asp Leu Arg Asn Ser Glu Gly Lys
 435 440 445

Ala Ile Phe Gly Arg Leu Val Ala Glu Ser Asp Ala Val Phe Ala Asn
 450 455 460

Phe Lys Pro Gly Thr Leu Thr Ser Leu Gly Phe Ser Tyr Asp Val Leu
 465 470 475 480

His Ala Phe Asn Pro Arg Ile Val Leu Ala Gly Ser Ser Ala Phe Gly
 485 490 495

Asn Arg Gly Pro Trp Ser Thr Arg Met Gly Tyr Gly Pro Leu Val Arg
 500 505 510

Ala Ala Thr Gly Val Thr Arg Val Trp Thr Ser Asp Glu Ala Gln Pro
 515 520 525

Asp Asn Ser Arg His Pro Phe Tyr Asp Ala Thr Thr Ile Phe Pro Asp

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530	535	540
His Val Val Gly Arg Val Gly Ala Leu Leu Ala Leu Ala Ala Leu Ile		
545	550	555 560
His Arg Asp Arg Thr Gly Gly Gly Ala His Val His Ile Ser Gln Ala		
	565	570 575
Glu Val Val Val Asn Gln Leu Asp Thr Met Phe Val Ala Glu Ala Ala		
	580	585 590
Arg Ala Thr Asp Val Ala Glu Ile His Pro Asp Thr Ser Val His Ala		
	595	600 605
Val Tyr Pro Cys Ala Gly Asp Asp Glu Trp Cys Val Ile Ser Ile Arg		
	610	615 620
Ser Asp Asp Glu Trp Arg Arg Ala Thr Ser Val Phe Gly Gln Pro Glu		
	625	630 635 640
Leu Ala Asn Asp Pro Arg Phe Gly Ala Ser Arg Ser Arg Val Ala Asn		
	645	650 655
Arg Ser Glu Leu Val Ala Ala Val Ser Ala Trp Thr Ser Thr Arg Thr		
	660	665 670
Pro Val Gln Ala Ala Gly Ala Leu Gln Ala Ala Gly Val Ala Ala Gly		
	675	680 685
Pro Met Asn Arg Pro Ser Asp Ile Leu Glu Asp Pro Gln Leu Ile Glu		
	690	695 700
Arg Asn Leu Phe Arg Asp Met Val His Pro Leu Ile Ala Arg Pro Leu		
	705	710 715 720
Pro Ala Glu Thr Gly Pro Ala Pro Phe Arg His Ile Pro Gln Ala Pro		
	725	730 735
Gln Arg Pro Ala Pro Leu Pro Gly Gln Asp Ser Val Gln Ile Cys Arg		
	740	745 750
Lys Leu Leu Gly Met Thr Ala Asp Glu Thr Glu Arg Leu Ile Asn Glu		
	755	760 765

-154-

Arg Val Met Phe Gly Pro Ala Val Thr Ala
770 775

<210> 128

<211> 2334

<212> DNA

<213> Mycobacterium tuberculosis

<400> 128

```

atggtgacac gactgctcgc cgacctgggc gcagacgttc tcaaggtgga acccccgggc      60
ggcagcccag gacgccacgt gcggcccacg ctggccggca ccagcatcgg gttcgccatg      120
cacaacgcga acaaacgcag cgcagtgttc aaccgcctcg acgagagcga ccgtcggcgg      180
ttcttggaac tcgccgccag cgccgacatc gtcgtcgact gtggctcttc gggacaggcc      240
gccgcgtacg gggcatcgtg tgccgagttg gccgatcgtc accgacacct ggtggcgctg      300
tcgatcaccg actttggcgc tgccggtccg cggtcgtcat ggcgcgcgac cgatccggtg      360
ctgtacgcga tgagtgggtc tctctcgcgg tcggggccta ccgccggcac gccggtactg      420
ccgccggacg gtatcgcttc ggcaaccgca gcggtgcagg cagcctgggc cgtactggtc      480
gcctatttca accgattacg ttgtggtact ggggattaca tcgacttctc ccggtttgac      540
gccgtcgtta tggcgttgga tcccccttc ggggcgcacg ggcaggtcgc agccggcatc      600
cgcagcaccg ggcgatggcg gggacggccc aagaaccagg acgcttaccg gatttatccg      660
tgccgggacg gctacgtacg gttctgcgtg atggcgccgc ggcagtggcg cgggctgcgc      720
cgctggttgg gggagcccga agattttcag gaccccaagt acgacgtgat cggcgcacgt      780
ttggccgcag ggccgcagat cagcgtgttg gtcgcgaagt tgtgcgccga gaagaccatg      840
aaggagttag tggcagccgg ccaagcgctc ggggttccca ttaaccggtg gctgacaccg      900
tcgagaatcc tggcctccga acacttccag gcggtgggtg cgatcaccga tgccgagctc      960
gttccggggg tgcgcaccgg ggtgcctacc ggatacttcg ttgtcgacgg gaagcgcgcc     1020
ggtttccgta ctccggcccc cgccgcgggg caggacgaac cgcgctggct cgcggatcca     1080
gcgccggtgc cccacacctc aggcgggtgc ggcggctatc cattcgaagg tctgcggatt     1140
cttgatctgg gcacatcgt ggccggcggc gagctcagcc ggctgttcgg cgacttgggc     1200
gccgaggtca tcaaggtcga aagtgccgac cccccgacg ggttgccgca gacccgagtc     1260
ggggatgcga tgagtgaatc attcgcgtgg acccatcgca atcacctcgc gctgggcctg     1320

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-155-

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<210> 129

<211> 1459

<212> PRT

<213> Mycobacterium tuberculosis

<400> 129

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Gly Gly Ala Gly Ser Glu Pro Met Ser Ala Ala Ala Val Ala Trp Asp
 20 25 30

Gln Leu Ala Met Glu Leu Ala Ser Ala Ala Ala Ser Phe Asn Ser Val
 35 40 45

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Thr Ser Gly Leu Val Gly Glu Ser Trp Leu Gly Pro Ser Ser Ala Ala
 50 55 60

Met Ala Ala Ala Val Ala Pro Tyr Leu Gly Trp Leu Ala Ala Ala Ala
 65 70 75 80

Ala Gln Ala Gln Arg Ser Ala Thr Gln Ala Ala Ala Leu Val Ala Glu
 85 90 95

Phe Glu Ala Val Arg Ala Ala Met Val Gln Pro Ala Leu Val Ala Ala
 100 105 110

Asn Arg Ser Asp Leu Val Ser Leu Val Phe Ser Asn Phe Phe Gly Gln
 115 120 125

Asn Ala Pro Ala Ile Ala Ala Ile Glu Ala Ala Tyr Glu Gln Met Trp
 130 135 140

Ala Ile Asp Val Ser Val Met Ser Ala Tyr His Ala Gly Ala Ser Ala
 145 150 155 160

Val Ala Ser Ala Leu Thr Pro Phe Thr Ala Pro Pro Gln Asn Leu Thr
 165 170 175

Asp Leu Pro Ala Gln Leu Ala Ala Ala Pro Ala Ala Val Val Thr Ala
 180 185 190

Ala Ile Thr Ser Ser Lys Gly Val Leu Ala Asn Leu Ser Leu Gly Leu
 195 200 205

Ala Asn Ser Gly Phe Gly Gln Met Gly Ala Ala Asn Leu Gly Ile Leu
 210 215 220

Asn Leu Gly Ser Leu Asn Pro Gly Gly Asn Asn Phe Gly Leu Gly Asn
 225 230 235 240

Val Gly Ser Asn Asn Val Gly Leu Gly Asn Thr Gly Asn Gly Asn Ile
 245 250 255

Gly Phe Gly Asn Thr Gly Asn Gly Asn Ile Gly Phe Gly Leu Thr Gly
 260 265 270

Asp Asn Gln Gln Gly Phe Gly Gly Trp Asn Ser Gly Thr Gly Asn Ile
 275 280 285

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Gly Leu Phe Asn Ser Gly Thr Gly Asn Ile Gly Ile Gly Asn Thr Gly
 290 295 300

Thr Gly Asn Phe Gly Ile Gly Asn Ser Gly Thr Ser Tyr Asn Thr Gly
 305 310 315 320

Ile Gly Asn Thr Gly Gln Ala Asn Thr Gly Phe Phe Asn Ala Gly Ile
 325 330 335

Ala Asn Thr Gly Ile Gly Asn Thr Gly Asn Tyr Asn Thr Gly Ser Phe
 340 345 350

Asn Leu Gly Ser Phe Asn Thr Gly Asp Phe Asn Thr Gly Ser Ser Asn
 355 360 365

Thr Gly Phe Phe Asn Pro Gly Asn Leu Asn Thr Gly Val Gly Asn Thr
 370 375 380

Gly Asn Val Asn Thr Gly Gly Phe Asn Ser Gly Asn Tyr Ser Asn Gly
 385 390 395 400

Phe Phe Trp Arg Gly Asp Tyr Gln Gly Leu Ile Gly Phe Ser Gly Thr
 405 410 415

Leu Thr Ile Pro Ala Ala Gly Leu Asp Leu Asn Gly Leu Gly Ser Val
 420 425 430

Gly Pro Ile Thr Ile Pro Ser Ile Thr Ile Pro Glu Ile Gly Leu Gly
 435 440 445

Ile Asn Ser Ser Gly Ala Leu Val Gly Pro Ile Asn Val Pro Pro Ile
 450 455 460

Thr Val Pro Ala Ile Gly Leu Gly Ile Asn Ser Thr Gly Ala Leu Val
 465 470 475 480

Gly Pro Ile Asn Ile Pro Pro Ile Thr Leu Asn Ser Ile Gly Leu Glu
 485 490 495

Leu Ser Ala Phe Gln Val Ile Asn Val Gly Ser Ile Ser Ile Pro Ala
 500 505 510

Ser Pro Leu Ala Ile Gly Leu Phe Gly Val Asn Pro Thr Val Gly Ser

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515	520	525
Ile Gly Pro Gly Ser Ile Ser Ile Gln Leu Gly Thr Pro Glu Ile Pro 530	535	540
Ala Ile Pro Pro Phe Phe Pro Gly Phe Pro Pro Asp Tyr Val Thr Val 545	550	555 560
Ser Gly Gln Ile Gly Pro Ile Thr Phe Leu Ser Gly Gly Tyr Ser Leu 565	570	575
Pro Ala Ile Pro Leu Gly Ile Asp Val Gly Gly Gly Leu Gly Pro Phe 580	585	590
Thr Val Phe Pro Asp Gly Tyr Ser Leu Pro Ala Ile Pro Leu Gly Ile 595	600	605
Asp Val Gly Gly Gly Leu Gly Pro Phe Thr Val Phe Pro Asp Gly Tyr 610	615	620
Ser Leu Pro Ala Ile Pro Leu Gly Ile Asp Val Gly Gly Gly Leu Gly 625	630	635 640
Pro Phe Thr Val Phe Pro Asp Gly Tyr Ser Leu Pro Ala Ile Pro Leu 645	650	655
Gly Ile Asp Val Gly Gly Ala Ile Gly Pro Leu Thr Thr Pro Pro Ile 660	665	670
Thr Ile Pro Ser Ile Pro Leu Gly Ile Asp Val Ser Gly Ser Leu Gly 675	680	685
Pro Ile Asn Ile Pro Ile Glu Ile Ala Gly Thr Pro Gly Phe Gly Asn 690	695	700
Ser Thr Thr Thr Pro Ser Ser Gly Phe Phe Asn Ser Gly Thr Gly Gly 705	710	715 720
Thr Ser Gly Phe Gly Asn Val Gly Ser Gly Gly Ser Gly Phe Trp Asn 725	730	735
Ile Ala Gly Asn Leu Gly Asn Ser Gly Phe Leu Asn Val Gly Pro Leu 740	745	750

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Thr Ser Gly Ile Leu Asn Phe Gly Asn Thr Val Ser Gly Leu Tyr Asn
 755 760 765

Thr Ser Thr Leu Gly Leu Ala Thr Ser Ala Phe His Ser Gly Val Gly
 770 775 780

Asn Thr Asp Ser Gln Leu Ala Gly Phe Met Arg Asn Ala Ala Gly Gly
 785 790 795 800

Thr Leu Phe Asn Phe Gly Phe Ala Asn Asp Gly Thr Leu Asn Leu Gly
 805 810 815

Asn Ala Asn Leu Gly Asp Tyr Asn Val Gly Ser Gly Asn Val Gly Ser
 820 825 830

Tyr Asn Phe Gly Ser Gly Asn Ile Gly Asn Gly Ser Phe Gly Phe Gly
 835 840 845

Asn Ile Gly Ser Asn Asn Phe Gly Phe Gly Asn Val Gly Ser Asn Asn
 850 855 860

Leu Gly Phe Ala Asn Thr Gly Pro Gly Leu Thr Glu Ala Leu His Asn
 865 870 875 880

Ile Gly Phe Gly Asn Ile Gly Gly Asn Asn Tyr Gly Phe Ala Asn Ile
 885 890 895

Gly Asn Gly Asn Ile Gly Phe Gly Asn Thr Gly Thr Gly Asn Ile Gly
 900 905 910

Ile Gly Leu Thr Gly Asp Asn Gln Val Gly Phe Gly Ala Leu Asn Ser
 915 920 925

Gly Ser Gly Asn Ile Gly Phe Phe Asn Ser Gly Asn Gly Asn Ile Gly
 930 935 940

Phe Phe Asn Ser Gly Asn Gly Asn Val Gly Ile Gly Asn Ser Gly Asn
 945 950 955 960

Tyr Asn Thr Gly Leu Gly Asn Val Gly Asn Ala Asn Thr Gly Leu Phe
 965 970 975

Asn Thr Gly Asn Val Asn Thr Gly Ile Gly Asn Ala Gly Ser Tyr Asn
 980 985 990

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Thr Gly Ser Tyr Asn Ala Gly Asp Thr Asn Thr Gly Asp Leu Asn Pro
 995 1000 1005

Gly Asn Ala Asn Thr Gly Tyr Leu Asn Leu Gly Asp Leu Asn Thr
 1010 1015 1020

Gly Trp Gly Asn Ile Gly Asp Leu Asn Thr Gly Ala Leu Ile Ser
 1025 1030 1035

Gly Ser Tyr Ser Asn Gly Ile Leu Trp Arg Gly Asp Tyr Gln Gly
 1040 1045 1050

Leu Ile Gly Tyr Ser Asp Thr Leu Ser Ile Pro Ala Ile Pro Leu
 1055 1060 1065

Ser Val Glu Val Asn Gly Gly Ile Gly Pro Ile Val Val Pro Asp
 1070 1075 1080

Ile Thr Ile Pro Gly Ile Pro Leu Ser Leu Asn Ala Leu Gly Gly
 1085 1090 1095

Val Gly Pro Ile Val Val Pro Asp Ile Thr Ile Pro Gly Ile Pro
 1100 1105 1110

Leu Ser Leu Asn Ala Leu Gly Gly Val Gly Pro Ile Val Val Pro
 1115 1120 1125

Asp Ile Thr Ile Pro Gly Ile Pro Leu Ser Leu Asn Ala Leu Gly
 1130 1135 1140

Gly Val Gly Pro Ile Val Val Pro Asp Ile Thr Ile Pro Gly Ile
 1145 1150 1155

Pro Leu Ser Leu Asn Ala Leu Gly Gly Val Gly Pro Ile Val Val
 1160 1165 1170

Pro Asp Ile Thr Ile Pro Gly Ile Pro Leu Ser Leu Asn Ala Leu
 1175 1180 1185

Gly Gly Val Gly Pro Ile Thr Val Pro Gly Val Pro Ile Ser Arg
 1190 1195 1200

Ile Pro Leu Thr Ile Asn Ile Arg Ile Pro Val Asn Ile Thr Leu

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1205	1210	1215
Asn Glu Leu Pro Phe Asn Val	Ala Gly Ile Phe Thr	Gly Tyr Ile
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Gly Pro Ile Pro Leu Ser Thr	Phe Val Leu Gly Val	Thr Leu Ala
1235	1240	1245
Gly Gly Thr Leu Glu Ser Gly	Ile Gln Gly Phe Ser	Val Asn Pro
1250	1255	1260
Phe Gly Leu Asn Ile Pro Leu	Ser Gly Ala Thr Asn	Ala Val Thr
1265	1270	1275
Ile Pro Gly Phe Ala Ile Asn	Pro Phe Gly Leu Asn	Val Pro Leu
1280	1285	1290
Ser Gly Gly Thr Ser Pro Val	Thr Ile Pro Gly Phe	Ala Ile Asn
1295	1300	1305
Pro Phe Gly Leu Asn Val Pro	Leu Ser Gly Gly Thr	Ser Pro Val
1310	1315	1320
Thr Ile Pro Gly Phe Thr Ile	Pro Gly Ser Pro Leu	Asn Leu Thr
1325	1330	1335
Ala Asn Gly Gly Leu Gly Pro	Ile Asn Ile Pro Ile	Asn Ile Thr
1340	1345	1350
Ser Ala Pro Gly Phe Gly Asn	Ser Thr Thr Thr Pro	Ser Ser Gly
1355	1360	1365
Phe Phe Asn Ser Gly Asp Gly	Ser Ala Ser Gly Phe	Gly Asn Val
1370	1375	1380
Gly Pro Gly Ile Ser Gly Leu	Trp Asn Gln Val Pro	Asn Ala Leu
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Gln Gly Gly Val Ser Gly Ile	Tyr Asn Val Gly Gln	Leu Ala Ser
1400	1405	1410
Gly Val Ala Asn Leu Gly Asn	Thr Val Ser Gly Phe	Asn Asn Thr
1415	1420	1425

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Ser Thr Val Gly His Leu Thr Ala Ala Phe Asn Ser Gly Val Asn
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Asn Ile Gly Gln Met Leu Leu Gly Phe Phe Ser Pro Gly Ala Gly
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Pro

<210> 130

<211> 4377

<212> DNA

<213> Mycobacterium tuberculosis

<400> 130

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<210> 131

<211> 171

<212> PRT

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<213> Mycobacterium tuberculosis

<400> 131

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Glu Val Gly Leu Arg Arg Val Phe Gly Cys Phe Pro Cys Gly Val Ile
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Ala Val Cys Ala Met Val Asp Asp Gln Pro Val Gly Met Ala Ala Ser
 35 40 45

Ser Phe Thr Ser Val Ser Val Asp Pro Pro Leu Val Ser Ile Cys Val
 50 55 60

Gln Asn Cys Ser Thr Thr Trp Pro Lys Leu Arg Asp Arg Pro Arg Leu
 65 70 75 80

Gly Val Ser Val Leu Ala Glu Gly His Asp Ala Ala Cys Met Ser Leu
 85 90 95

Ser Arg Lys Glu Gly Asn Arg Phe Ala Gly Val Phe Trp Ser Glu Leu
 100 105 110

Ser Ser Gly Gly Val Val Ile Ala Gly Ala Gly Ala Trp Leu Asp Cys
 115 120 125

Arg Pro Tyr Ala Glu Ile Pro Ala Gly Asp His Leu Ile Ala Leu Leu
 130 135 140

Glu Ile Cys Ala Val Arg Ala Asp Pro Glu Thr Pro Pro Leu Val Phe
 145 150 155 160

His Gly Ser Arg Phe Arg Arg Leu Glu Ser Arg
 165 170

<210> 132

<211> 513

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 132
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<210> 133

<211> 233

<212> PRT

<213> Mycobacterium tuberculosis

<400> 133

Ala Ala Gln Thr Thr Thr Leu\Pro Asp Glu Pro Arg Asn Gly Val Thr
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Gly Gly Ile Asp Trp Ala Arg Asp Asp His Ala Ala Ser Ile Val Asp
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Ala Arg Gly Arg Glu Val Arg Arg Ala Thr Ile Glu His Asn Ala Ala
 35 40 45

Gly Leu Arg Glu Leu Leu Glu Leu Leu Ser Arg Ala Gly Ala Arg Glu
 50 55 60

Val Ala Ile Glu Arg Pro Asp Gly Pro Val Val Asp Thr Leu Leu Glu
 65 70 75 80

Ala Gly Ile Thr Val Val Val Ile Ser Pro Asn Gln Leu Lys Asn Leu
 85 90 95

Arg Gly Arg Tyr Gly Ser Ala Gly Asn Lys Asp Asp Arg Phe Asp Ala

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100	105	110
Phe Val Leu Ala Asp Thr Leu Arg Thr Asp Arg Ser Arg Leu Arg Pro		
115	120	125
Leu Leu Pro Asp Thr Pro Ala Thr Ala Thr Leu Arg Arg Thr Cys Arg		
130	135	140
Pro Arg Lys Asp Leu Val Ala His Arg Val Ala Leu Ala Asn Gln Leu		
145	150	155 160
Arg Ala His Leu Arg Val Val Phe Pro Gly Val Val Gly Leu Phe Ala		
165	170	175
Asp Leu Asp Ser Pro Ile Ser Leu Ala Phe Leu Thr Phe Leu Pro Arg		
180	185	190
Phe Asp Cys Gln Asp Arg Ala Asp Trp Leu Ser Val Lys Arg Leu Ala		
195	200	205
Gly Trp Leu Ala Ala Ala Gly Tyr Cys Gly Arg Ala Pro Arg Pro Ala		
210	215	220
His Arg Cys Pro Ala Arg Arg His Arg		
225	230	

<210> 134

<211> 699

<212> DNA

<213> Mycobacterium tuberculosis

<400> 134

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gccgggatca cggtggtggt gatcagcccc aaccagctga agaattcgcg cggtcgttac	300
ggctcggctg gcaacaagga cgaccggttc gacgcgttcg tgctcgccga cacgttgccg	360

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accgaccggt cccggctgcg cccctgctg cccgacaccc cggccacggc caccctgcgc 420
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 cgcgcgacc tgcgctcgt ctttcgggt gtggtcgggt tggtcgtga ccttgactcg 540
 ccgatcagcc tcgctttttt gacgtttttg ccccgtttcg actgccagga ccgcgcgga 600
 tggctgtcgg tcaagcgctt ggccggctgg ctggccgccc ctggctactg cggccgtgct 660
 ccacgaccgg ctcaccggtg ccccgcgcg cgccaccgg 699

<210> 135

<211> 573

<212> PRT

<213> Mycobacterium tuberculosis

<400> 135

Val Thr His Pro Asp Arg Ala Asn Val Asn Pro Gly Ser Pro Pro Leu
 1 5 10 15

Arg Glu Thr Leu Ser Gln Leu Arg Leu Arg Glu Leu Leu Leu Glu Val
 20 25 30

Gln Asp Arg Ile Glu Gln Ile Val Glu Gly Arg Asp Arg Leu Asp Gly
 35 40 45

Leu Ile Asp Ala Ile Leu Ala Ile Thr Ser Gly Leu Lys Leu Asp Ala
 50 55 60

Thr Leu Arg Ala Ile Val His Thr Ala Ala Glu Leu Val Asp Ala Arg
 65 70 75 80

Tyr Gly Ala Leu Gly Val Arg Gly Tyr Asp His Arg Leu Val Glu Phe
 85 90 95

Val Tyr Glu Gly Ile Asp Glu Glu Thr Arg His Leu Ile Gly Ser Leu
 100 105 110

Pro Glu Gly Arg Gly Val Leu Gly Ala Leu Ile Glu Glu Pro Lys Pro
 115 120 125

Ile Arg Leu Asp Asp Ile Ser Arg His Pro Ala Ser Val Gly Phe Pro

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130	135	140
Leu His His Pro Pro Met Arg Thr Phe Leu Gly Val Pro Val Arg Ile		
145	150	155 160
Arg Asp Glu Val Phe Gly Asn Leu Tyr Leu Thr Glu Lys Ala Asp Gly		
	165	170 175
Gln Pro Phe Ser Asp Asp Asp Glu Val Leu Val Gln Ala Leu Ala Ala		
	180	185 190
Ala Ala Gly Ile Ala Val Asp Asn Ala Arg Leu Phe Glu Glu Ser Arg		
	195	200 205
Thr Arg Glu Ala Trp Ile Glu Ala Thr Arg Asp Ile Gly Thr Gln Met		
	210	215 220
Leu Ala Gly Ala Asp Pro Ala Met Val Phe Arg Leu Ile Ala Glu Glu		
	225	230 235 240
Ala Leu Thr Leu Met Ala Gly Ala Ala Thr Leu Val Ala Val Pro Leu		
	245	250 255
Asp Asp Glu Ala Pro Ala Cys Glu Val Asp Asp Leu Val Ile Val Glu		
	260	265 270
Val Ala Gly Glu Ile Ser Pro Ala Val Lys Gln Met Thr Val Ala Val		
	275	280 285
Ser Gly Thr Ser Ile Gly Gly Val Phe His Asp Arg Thr Pro Arg Arg		
	290	295 300
Phe Asp Arg Leu Asp Leu Ala Val Asp Gly Pro Val Glu Pro Gly Pro		
	305	310 315 320
Ala Leu Val Leu Pro Leu Arg Ala Ala Asp Thr Val Ala Gly Val Leu		
	325	330 335
Val Ala Leu Arg Ser Ala Asp Glu Gln Pro Phe Ser Asp Lys Gln Leu		
	340	345 350
Asp Met Met Ala Ala Phe Ala Asp Gln Ala Ala Leu Ala Trp Arg Leu		
	355	360 365

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Ala Thr Ala Gln Arg Gln Met Arg Glu Val Glu Ile Leu Thr Asp Arg
 370 375 380

Asp Arg Ile Ala Arg Asp Leu His Asp His Val Ile Gln Arg Leu Phe
 385 390 395 400

Ala Val Gly Leu Thr Leu Gln Gly Ala Ala Pro Arg Ala Arg Val Pro
 405 410 415

Ala Val Arg Glu Ser Ile Tyr Ser Ser Ile Asp Asp Leu Gln Glu Ile
 420 425 430

Ile Gln Glu Ile Arg Ser Ala Ile Phe Asp Leu His Ala Gly Pro Ser
 435 440 445

Arg Ala Thr Gly Leu Arg His Arg Leu Asp Lys Val Ile Asp Gln Leu
 450 455 460

Ala Ile Pro Ala Leu His Thr Thr Val Gln Tyr Thr Gly Pro Leu Ser
 465 470 475 480

Val Val Asp Thr Val Leu Ala Asn His Ala Glu Ala Val Leu Arg Glu
 485 490 495

Ala Val Ser Asn Ala Val Arg His Ala Asn Ala Thr Ser Leu Ala Ile
 500 505 510

Asn Val Ser Val Glu Asp Asp Val Arg Val Glu Val Val Asp Asp Gly
 515 520 525

Val Gly Ile Ser Gly Asp Ile Thr Glu Ser Gly Leu Arg Asn Leu Arg
 530 535 540

Gln Arg Ala Asp Asp Ala Gly Gly Glu Phe Thr Val Glu Asn Met Pro
 545 550 555 560

Thr Gly Gly Thr Leu Leu Arg Trp Ser Ala Pro Leu Arg
 565 570

<210> 136

<211> 1719

<212> DNA

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<213> *Mycobacterium tuberculosis*

<400> 136

gtgacacacc ctgacagggc gaacgttaac cctggcagcc cgccattgcg cgagacactg	60
tgcgagcttc ggttgcgaga gctgctgctg gaagtccaag accggattga acagatcgtc	120
gaaggccgcg accggctgga tggctctgac gacgccatct tggcgatcac atcgggactc	180
aagctcgacg ccacctgcg cgccattgtg cataccgccg ccgagttggt ggatgcccgc	240
tacggggcgc tgggggtgcg cggttacgac catagattgg tcgaattcgt ctacgagggg	300
atcgacgaag agaccggca cctcatcggc tcattgccgg aggggcgagg tgttctcggc	360
gcgctgatcg aggagccaaa gccgatccgg ctggacgata tctcgcggca tcccgcacgc	420
gttggatttc cgctgcacca tccgccgatg cggaccttcc tcggggttcc agtgcgcatc	480
cgcgacgagg tgttcggcaa tctttacttg accgagaagg cagatggcca gccgttcagc	540
gatgacgacg aggtgctggt gcaggcgctg gccgcgcgg ccgggattgc cgttgacaat	600
gcccgctctt tcgaggaatc acggaccggg gaagcgtgga tcgaggcaac ccgcgacatc	660
ggaacgcaga tgctggccgg tcgggaccgg gccatggtgt ttcggctcat cgccgaggaa	720
gcgttgacgt tgatggctgg ggcagccacc ttggtggcgg tgccgctcga cgacgaagcg	780
ccggcttgcg aggtcgacga cctggctcat gtagaggtgg ccggagagat ctccccggcg	840
gtcaagcaaa tgacggttgc cgtcagcggg acgtcgatcg ggggagtctt tcacgaccgt	900
acgccccgcc ggctcgaccg gcttgacctc gcggctgacg gcccggtgga gcccgggccc	960
gccctggtgc tgccgctgcg tgccgccgac actgttgccg gtgtgctggt cgcacttcgc	1020
agtgccgatg aacagccgtt cagcgacaaa cagctcgata tgatggccgc cttecgctgac	1080
caggctgcgc tcgcctggcg gctggcgacc gcgcagcgac agatgcgaga agtggagatc	1140
ctgaccgatc gcgaccggat cgcacgtgat ctgcatgacc acgtcatcca gcggctcttc	1200
gcagtcgggc tcacctgca gggtgccgct ccgcgagcac gtgtccccgc cgtccgggaa	1260
tccatctaca gcagcatcga cgatctccag gaaatcattc aggagattcg atctgcgatc	1320
ttcgacctac acgcccggcc ctccccggcg acgggtctgc gccaccgact ggacaaggtc	1380
atcgaccaac tcgcgatccc cgcgctgcac accacggctc agtacacggg cccgctgtcc	1440
gttgtcgaca ccgtcctggc caaccacgcc gaagcggttc tcggggaggc ggtagcaac	1500
gctgtccggc acgcgaacgc gaccagcctg gccatcaacg tcagcgtcga ggatgatgtg	1560
cgggtcgagg tcgtcgacga cgggtgcggc atctccggcg acatcaccga aagcggcctg	1620

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cgcaatctcc gccagcgtgc cgacgacgcg ggcggcgaat tcacagtcga gaacatgccg 1680
 accggaggca ccttgctgcg gtggtctgca ccgctgcgc 1719

<210> 137

<211> 217

<212> PRT

<213> Mycobacterium tuberculosis

<400> 137

Ala Asn His Arg Asn Thr Gln Gly Arg Asn Glu Phe Leu Arg Ala Glu
 1 5 10 15

Val Arg Pro Ala Thr Pro Leu Ile Cys Ala Phe Gly Asp Lys His Lys
 20 25 30

His Thr Tyr Gly Val Thr Pro Ile Cys Arg Ala Leu Ala Val His Gly
 35 40 45

Val Gln Ile Ala Ser Arg Thr Tyr Phe Ala Asp Arg Ala Ala Ala Pro
 50 55 60

Ser Lys Arg Ala Leu Trp Asp Thr Thr Ile Thr Glu Ile Leu Ala Gly
 65 70 75 80

Tyr Tyr Glu Pro Asp Ala Glu Gly Lys Arg Pro Pro Glu Cys Leu Tyr
 85 90 95

Gly Ser Leu Lys Met Trp Ala His Leu Gln Arg Gln Gly Phe Arg Trp
 100 105 110

Pro Ser Ala Thr Val Lys Thr Ile Met Arg Ala Asn Gly Trp Arg Gly
 115 120 125

Val Pro Leu Ala Ala His Ile Thr His His Arg Thr Arg Pro Gly Arg
 130 135 140

Gly Pro Gly Pro Arg Pro Gly Gly Ser Ala Met Ala Gly Phe Ser Asn
 145 150 155 160

Glu Pro Ala Gly Ser Gly Arg Leu His Leu Arg Ala Asp Asp Val Glu

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165

170

175

Phe Arg Leu His Arg Val Arg Gly Arg Arg Leu Arg Arg Cys Asp Arg
 180 185 190

Gly Leu Gly Met Leu Ala Asp Gln Arg Arg Ser Val Arg Arg Thr Arg
 195 200 205

Ile Thr Pro Arg Pro Ser Arg Leu Thr
 210 215

<210> 138

<211> 651

<212> DNA

<213> Mycobacterium tuberculosis

<400> 138

gcaaaccatc gaaataactca aggtcgcaac gagtttcttc gcgcggaagt gcgacccgcg 60
 acaccgctga tctgtgcgtt cggcgacaag cacaagcaca cctacgggggt cacaccgatc 120
 tgtcggggcac tggccgtgca cggcgtgcag atcgccctcgc gcacctatctt cgcggatcgc 180
 gcggcagcgc cttcgaaaacg cgcactgtgg gacaccacaa tcaccgaaat cctggccggc 240
 tactacgaac ccgacgccga gggcaaacgc ccaccggaat gcctgtacgg cagcctgaag 300
 atgtggggcgc acctgcagcg ccagggtctc cgggtggccct ctgccacggt gaagacgatc 360
 atgcggggcca acggttggcg cggagtgcc ctcgcagcgc acatcacaca ccaccgaacc 420
 agacccggcc gcggcccagg ccctagacct ggccgggtcgg caatggcggg ctttagcaac 480
 gaacctgctg gaagcggccg acttcaccta cgcgccgatg acgtggagtt ccggctacac 540
 cgcgttcgtg gtcgacgcct acgccggtgt gatcgcgggc tgggaatgct cgctgaccaa 600
 agacgcagcg ttcgtcgaac gcgcattacg ccacggcctt ccagactcac c 651

<210> 139

<211> 121

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 139

Pro Lys Thr Gln Arg Ser Ser Asn Ala His Tyr Ala Thr Ala Phe Gln
 1 5 10 15

Thr His Leu Gly His Pro Phe Gly Gly Ala Ile His His Arg Asp Ala
 20 25 30

Gly Ser Gln Tyr Thr Ala Ile Tyr Phe Gly Lys Thr Pro Met Leu Ala
 35 40 45

Gly Leu Arg Pro Ser Ile Gly Ile Val Gly Asp Ala Leu Asp Asn Ala
 50 55 60

Leu Cys Glu Thr Thr Thr Gly Pro His Arg Thr Glu Cys Ser His Gly
 65 70 75 80

Ser Pro Phe Arg Ser Gly Pro Ile Arg Thr Leu Ala Asp Leu Glu Asp
 85 90 95

Ile Ala Ser Ala Trp Val Glu His Thr Cys His Thr Gln Gln Gly Val
 100 105 110

Arg Ile Pro Gly Arg Leu Gln Pro Ala
 115 120

<210> 140

<211> 363

<212> DNA

<213> Mycobacterium tuberculosis

<400> 140

ccaaagacgc agcgttcgtc gaacgcgcac tacgccacgg ccttccagac tcacctaggt 60

cacccgtttg gcggagctat tcatcatcgc gacgccggaa gtcagtatac tgcaatatat 120

ttcggcaaga caccgatgct agccgggctg cgcccgctga taggcattgt tggcgacgcc 180

ctcgacaacg ccttatgtga aaccacgaca gggccccaca ggaccgaatg cagccacggc 240

agcccgtttc gtagcgggcc gatccgcacc ctggctgacc tggaagacat cgcctcggcg 300

tgggtggagc acacctgtca cacacaacaa ggtgtgcgaa taccggggag gcttcaacct 360

gcg 363

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<210> 141

<211> 375

<212> PRT

<213> Mycobacterium tuberculosis

<400> 141

Met Gly Ser Arg Arg Phe Asp Ala Glu Val Tyr Ala Arg Arg Leu Ala
 1 5 10 15

Leu Ala Ala Ala Ala Thr Ala Asp Ala Gly Leu Ala Gly Leu Val Ile
 20 25 30

Thr Pro Gly Tyr Asp Leu Cys Tyr Leu Ile Gly Ser Arg Ala Glu Thr
 35 40 45

Phe Glu Arg Leu Thr Ala Leu Val Leu Pro Ala Ala Gly Ala Pro Ala
 50 55 60

Val Val Leu Pro Arg Leu Glu Leu Ala Ala Leu Lys Gln Ser Ala Ala
 65 70 75 80

Ala Glu Leu Gly Leu Arg Val Cys Asp Trp Val Asp Gly Asp Asp Pro
 85 90 95

Tyr Gly Leu Val Ser Ala Val Leu Gly Gly Ala Pro Val Ala Thr Ala
 100 105 110

Val Thr Asp Ser Met Pro Ala Leu His Met Leu Pro Leu Ala Asp Ala
 115 120 125

Leu Gly Val Leu Pro Val Leu Ala Thr Asp Val Leu Arg Arg Leu Arg
 130 135 140

Met Val Lys Glu Glu Thr Glu Ile Asp Ala Leu Arg Lys Ala Gly Ala
 145 150 155 160

Ala Ile Asp Arg Val His Ala Arg Val Pro Glu Phe Leu Val Pro Gly
 165 170 175

Arg Thr Glu Ala Asp Val Ala Ala Asp Ile Ala Glu Ala Ile Val Ala

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180	185	190
Glu Gly His Ser Glu Val Ala Phe Val Ile Val Gly Ser Gly Pro His		
195	200	205
Gly Ala Asp Pro His His Gly Tyr Ser Asp Arg Glu Leu Arg Glu Gly		
210	215	220
Asp Ile Val Val Val Asp Ile Gly Gly Thr Tyr Gly Pro Gly Tyr His		
225	230	235
Ser Asp Ser Thr Arg Thr Tyr Ser Ile Gly Glu Pro Asp Ser Asp Val		
245	250	255
Ala Gln Ser Tyr Ser Met Leu Gln Arg Ala Gln Arg Ala Ala Phe Glu		
260	265	270
Ala Ile Arg Pro Gly Val Thr Ala Glu Gln Val Asp Ala Ala Ala Arg		
275	280	285
Asp Val Leu Ala Glu Ala Gly Leu Ala Glu Tyr Phe Val His Arg Thr		
290	295	300
Gly His Gly Ile Gly Leu Cys Val His Glu Glu Pro Tyr Ile Val Ala		
305	310	315
Gly Asn Asp Leu Val Leu Val Pro Gly Met Ala Phe Ser Ile Glu Pro		
325	330	335
Gly Ile Tyr Phe Pro Gly Arg Trp Gly Ala Arg Ile Glu Asp Ile Val		
340	345	350
Ile Val Thr Glu Asp Gly Ala Val Ser Val Asn Asn Cys Pro His Glu		
355	360	365
Leu Ile Val Val Pro Val Ser		
370	375	

<210> 142

<211> 1125

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 142
 atgggttctc gccgattcga cgcgaggtt tatgcacggc ggctggcttt agcggcggcc 60
 gcgacggcgg acgcgggtct ggcggtctg gtgataactc ccggctacga cctgtgttac 120
 ctcacgggt cgcgagcggg gacgttcgag cggctcaccg cgttggtgtt gccggccgcc 180
 ggtgcgccgg cggttgtgct gcccgggctg gagctcgccg cctcaagca atccgccga 240
 gcggaattgg gtctgcgct gtgcgattgg gtcgacggtg acgacccta cgggttggtg 300
 agtgccgtgt tgggcggagc tccggtagcg acccggtca ccgattccat gccggcgttg 360
 cacatgttgc cgctggccga cgactgggt gtgctgccg tattggccac cgactgctg 420
 cgcaggctgc ggatggtcaa ggaggaaacc gagatcgacg cgctgcgtaa ggccggcggc 480
 gcgatcgatc gagtgcacg ccgagtgcg gagtttctgg tccggggccg aacggaagcc 540
 gacgtagccg ccgacatcg cgaagcaatt gtcgccgaag ggcattcgga ggtagcgttc 600
 gtcacgtgg gttccgggcc gcacggcgcc gaccgcacg acgatattc ggaccgcgaa 660
 ttgcgggagg gtgacatcgt tgcgtcgac atcggcggca cgtatgggcc tggataccac 720
 tccgactcca ccgaacctc cagcatcgcc gagcctgatt ctgatgtagc gcagtcatat 780
 tcgatgttgc agcgagccca gcggggcggc ttcgaggcca tccgccagg ggtgacagcg 840
 gagcaggtgg acgcgccgc gcgtgacgtg ctgcgcgagg ccgggctcgc ggagtatttt 900
 gtgcaccgca ccgggcacgg catcggtg tgcgtgcacg aggagcccta tatcgtcgcc 960
 ggcaatgacc tgggtgttgg tcccgcatg gcgttttcca tcgagccggg aatctatttc 1020
 ccgggcgggt ggggcgccg catcgaggac atcgtgacg tgaccgagga cgggtgctgtg 1080
 tctgtcaaca actgcccgca cgagttgatc gtggtgccg tgtcc 1125

<210> 143

<211> 244

<212> PRT

<213> Mycobacterium tuberculosis

<400> 143

Met Ser Gly Pro Gln Gly Ser Asp Pro Arg Gln Pro Trp Gln Pro Pro
 1 5 10 15

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Gly Gln Gly Ala Asp His Ser Ser Asp Pro Thr Val Ala Ala Gly Tyr
 20 25 30

Pro Trp Gln Gln Gln Pro Thr Gln Glu Ala Thr Trp Gln Ala Pro Ala
 35 40 45

Tyr Thr Pro Gln Tyr Gln Gln Pro Ala Asp Pro Ala Tyr Pro Gln Gln
 50 55 60

Tyr Pro Gln Pro Thr Pro Gly Tyr Ala Gln Pro Glu Gln Phe Gly Ala
 65 70 75 80

Gln Pro Thr Gln Leu Gly Val Pro Gly Gln Tyr Gly Gln Tyr Gln Gln
 85 90 95

Pro Gly Gln Tyr Gly Gln Pro Gly Gln Tyr Gly Gln Pro Gly Gln Tyr
 100 105 110

Ala Pro Pro Gly Gln Tyr Pro Gly Gln Tyr Gly Pro Tyr Gly Gln Ser
 115 120 125

Gly Gln Gly Ser Lys Arg Ser Val Ala Val Ile Gly Gly Val Ile Ala
 130 135 140

Val Met Ala Val Leu Phe Ile Gly Ala Val Leu Ile Leu Gly Phe Trp
 145 150 155 160

Ala Pro Gly Phe Phe Val Thr Thr Lys Leu Asp Val Ile Lys Ala Gln
 165 170 175

Ala Gly Val Gln Gln Val Leu Thr Asp Glu Thr Thr Gly Tyr Gly Ala
 180 185 190

Lys Asn Val Lys Asp Val Lys Cys Asn Asn Gly Ser Asp Pro Thr Val
 195 200 205

Lys Lys Gly Ala Thr Phe Glu Cys Thr Val Ser Ile Asp Gly Thr Ser
 210 215 220

Lys Arg Val Thr Val Thr Phe Gln Asp Asn Lys Gly Thr Tyr Glu Val
 225 230 235 240

Gly Arg Pro Gln

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<210> 144

<211> 732

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 144

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atgagcggac cgcagggatc ggacccaagg cagccgtggc agccgcccgg ccagggcgcc      60
gaccattcct cggacccac cgtggccgcg ggatatccct ggcagcagca gccgaccacg      120
gagggcgacgt ggcaggcccc ggcgtacaca ccgcagtacc aacagccggc tgacccggcg      180
taccgcgagc agtaccgcga gccacacccc ggctatgcgc agcccgaaca gttcggtgca      240
cagcccaccc agtcggcggt gcccggtcag tacggccaat accagcagcc gggccaatat      300
ggccagccgg gacagtacgg ccagcccggc cagtacgcac cggccgggtca gtaccccggg      360
caatacggcc cgtatggcca gtcgggtcag gggtcgaagc gttcggttgc ggtgatcggc      420
ggcgtgatcg ccgtgatggc cgtgctgttc atcggcgcgg ttctaatact cggcttctgg      480
gcacccggat tcttcgtcac caccaagctg gacgtcatta aggcgcaggc cggtgtgcag      540
caggttctca ccgatgagac cacgggggtac ggcgccaaga acgtcaaaga cgtcaagtgc      600
aacaacgggt cagacccac ggtcaaaaag ggcgccacct tcgaatgcac ggtgagcatc      660
gacggcacct caaagcgcg gaccgtgacc ttccaggaca acaagggcac ctacgaggtc      720
ggccggccac ag

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732

<210> 145

<211> 308

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 145

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Val Arg Ala Ala Gly Leu Leu Lys Arg Leu Asn Pro Arg Asn Arg Arg
1           5           10           15

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Ser Arg Val Asn Pro Asp Ala Thr Met Ser Leu Val Asp His Leu Thr
20           25           30

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Glu Leu Arg Thr Arg Leu Leu Ile Ser Leu Ala Ala Ile Leu Val Thr
 35 40 45

Thr Ile Phe Gly Phe Val Trp Tyr Ser His Ser Ile Phe Gly Leu Asp
 50 55 60

Ser Leu Gly Glu Trp Leu Arg His Pro Tyr Cys Ala Leu Pro Gln Ser
 65 70 75 80

Ala Arg Ala Asp Ile Ser Ala Asp Gly Glu Cys Arg Leu Leu Ala Thr
 85 90 95

Ala Pro Phe Asp Gln Phe Met Leu Arg Leu Lys Val Gly Met Ala Ala
 100 105 110

Gly Ile Val Leu Ala Cys Pro Val Trp Phe Tyr Gln Leu Trp Ala Phe
 115 120 125

Ile Thr Pro Gly Leu Tyr Gln Arg Glu Arg Arg Phe Ala Val Ala Phe
 130 135 140

Val Ile Pro Ala Ala Val Leu Phe Val Ala Gly Ala Val Leu Ala Tyr
 145 150 155 160

Leu Val Leu Ser Lys Ala Leu Gly Phe Leu Leu Thr Val Gly Ser Asp
 165 170 175

Val Gln Val Thr Ala Leu Ser Gly Asp Arg Tyr Phe Gly Phe Leu Leu
 180 185 190

Asn Leu Leu Val Val Phe Gly Val Ser Phe Glu Phe Pro Leu Leu Ile
 195 200 205

Val Met Leu Asn Leu Ala Gly Leu Leu Thr Tyr Glu Arg Leu Lys Ser
 210 215 220

Trp Arg Arg Gly Leu Ile Phe Ala Met Phe Val Phe Ala Ala Ile Phe
 225 230 235 240

Thr Pro Gly Ser Asp Pro Phe Ser Met Thr Ala Leu Gly Ala Ala Leu
 245 250 255

Thr Val Leu Leu Glu Leu Ala Ile Gln Ile Ala Arg Val His Asp Lys
 260 265 270

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Arg Lys Ala Lys Arg Glu Ala Ala Ile Pro Asp Asp Glu Ala Ser Val
 275 280 285

Ile Asp Pro Pro Ser Pro Val Pro Ala Pro Ser Val Ile Gly Ser His
 290 295 300

Asp Asp Val Thr
 305

<210> 146

<211> 924

<212> DNA

<213> Mycobacterium tuberculosis

<400> 146

gtgcgcgccg ccggtcttct caaacggctc aaccacgta acaggcgag ccgcgtcaat 60
 cctgacgcga cgatgtcgct ggtecgaccac ctgaccgagt tacgcaccag gttgctgac 120
 tccctggccg cgatcttggt caccacaatc ttcgggttcg tctggtattc gcattcgatt 180
 ttcgggttgg acagcctcgg agagtggctg cggcatccct actgtgccct gccgcagtcg 240
 gcccgggcgg atatcagcgc cgacggagag tgccgtttgt tggccaccgc gccgttcgac 300
 cagttcatgt tgcggctcaa ggtegggatg gccgccggca ttgtgctggc ttgcccgggtg 360
 tggttctacc agctgtgggc gttcatcacg cctgggtctct accagagggga gcgccgcttc 420
 gcggtggcct tcgtgatccc agcagcggtg ctgttcgtcg ccggtgccgt actggcctac 480
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 gcgctgtctg gcgaccgcta ctttggtttt ctgctcaacc tgctggtggt gttcggggtc 600
 agcttcgaat tccccctgct gatcgtgatg ctgaacctgg egggcctgct gacctatgag 660
 cggctcaagt cttggcggcg cgggttgatc tttgcgatgt tcgtcttcgc ggcgatcttc 720
 acgcccggat ccgatccgtt ctcatgacc gcgctcggtg cggcgttgac cgtgctgcta 780
 gagctcgcca ttcagatcgc ccgctgcat gacaagcgaa aagccaagcg cgaagccgcg 840
 attcccagc acgaagcttc ggtcatcgac ccgccctcgc cggtgccggc gccatcggtc 900
 atcggatctc atgacgacgt cacg 924

<210> 147

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<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 147

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
1. 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
100 105

<210> 148

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 148

atgtcagggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
gtcgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcgccgt 120
ctacttggtg ttggtgcgc ggagacgggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
gccggcgcac ggccccggac cacgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
gacaacgccg aattgcgaag ggccaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300

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gccgagctcg accggccagc acgc

324

<210> 149

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 149

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
 20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 150

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 150

atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60

gtcgcagaga tccgcggtca gcacgattcg gagtgggcag cgatcagtga ggtcgccccgt 120

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ctacttgggtg ttggctgcgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
gccggcgcac ggcccgggac cacgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
gccgagctcg accggccagc acgc 324

<210> 151

<211> 414

<212> PRT

<213> Mycobacterium tuberculosis

<400> 151

Val Asn Asp Asn Gln Leu Ala Pro Val Ala Arg Pro Arg Ser Pro Leu
1 5 10 15

Glu Leu Leu Asp Thr Val Pro Asp Ser Leu Leu Arg Arg Leu Lys Gln
20 25 30

Tyr Ser Gly Arg Leu Ala Thr Glu Ala Val Ser Ala Met Gln Glu Arg
35 40 45

Leu Pro Phe Phe Ala Asp Leu Glu Ala Ser Gln Arg Ala Ser Val Ala
50 55 60

Leu Val Val Gln Thr Ala Val Val Asn Phe Val Glu Trp Met His Asp
65 70 75 80

Pro His Ser Asp Val Gly Tyr Thr Ala Gln Ala Phe Glu Leu Val Pro
85 90 95

Gln Asp Leu Thr Arg Arg Ile Ala Leu Arg Gln Thr Val Asp Met Val
100 105 110

Arg Val Thr Met Glu Phe Phe Glu Glu Val Val Pro Leu Leu Ala Arg
115 120 125

Ser Glu Glu Gln Leu Thr Ala Leu Thr Val Gly Ile Leu Lys Tyr Ser
130 135 140

Arg Asp Leu Ala Phe Thr Ala Ala Thr Ala Tyr Ala Asp Ala Ala Glu

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145	150	155	160
Ala Arg Gly Thr Trp Asp Ser Arg Met Glu Ala Ser Val Val Asp Ala	165	170	175
Val Val Arg Gly Asp Thr Gly Pro Glu Leu Leu Ser Arg Ala Ala Ala	180	185	190
Leu Asn Trp Asp Thr Thr Ala Pro Ala Thr Val Leu Val Gly Thr Pro	195	200	205
Ala Pro Gly Pro Asn Gly Ser Asn Ser Asp Gly Asp Ser Glu Arg Ala	210	215	220
Ser Gln Asp Val Arg Asp Thr Ala Ala Arg His Gly Arg Ala Ala Leu	225	230	235
Thr Asp Val His Gly Thr Trp Leu Val Ala Ile Val Ser Gly Gln Leu	245	250	255
Ser Pro Thr Glu Lys Phe Leu Lys Asp Leu Leu Ala Ala Phe Ala Asp	260	265	270
Ala Pro Val Val Ile Gly Pro Thr Ala Pro Met Leu Thr Ala Ala His	275	280	285
Arg Ser Ala Ser Glu Ala Ile Ser Gly Met Asn Ala Val Ala Gly Trp	290	295	300
Arg Gly Ala Pro Arg Pro Val Leu Ala Arg Glu Leu Leu Pro Glu Arg	305	310	315
Ala Leu Met Gly Asp Ala Ser Ala Ile Val Ala Leu His Thr Asp Val	325	330	335
Met Arg Pro Leu Ala Asp Ala Gly Pro Thr Leu Ile Glu Thr Leu Asp	340	345	350
Ala Tyr Leu Asp Cys Gly Gly Ala Ile Glu Ala Cys Ala Arg Lys Leu	355	360	365
Phe Val His Pro Asn Thr Val Arg Tyr Arg Leu Lys Arg Ile Thr Asp	370	375	380

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Phe Thr Gly Arg Asp Pro Thr Gln Pro Arg Asp Ala Tyr Val Leu Arg
 385 390 395 400

Val Ala Ala Thr Val Gly Gln Leu Asn Tyr Pro Thr Pro His
 405 410

<210> 152

<211> 1242

<212> DNA

<213> Mycobacterium tuberculosis

<400> 152

```

gtgaacgaca atcagttggc tccagttgcc cgcccgaggt cgccgctcga actgctggac      60
actgtgcccc attcgctgct gggcggttg aagcagtact cgggcgggct ggccaccgag      120
gcagtttcgg ccatgcaaga acggttgccg ttcttcgccg acctagaagc gtcccagcgc      180
gccagcgtgg cgctgggtgg gcagacggcc gtggtcaact tcgtcgaatg gatgcacgac      240
ccgcacagtg acgtcggcta taccgcgcag gcattcgagc tggtgcccca ggatctgacg      300
cgacggatcg cgctgcgcca gaccgtggac atggtgcggg tcaccatgga gttcttcgaa      360
gaagtcgtgc ccctgctcgc cgttccgaa gagcagttga ccgccctcac ggtgggcatt      420
ttgaaataca gccgcgacct ggcattcacc gccgccacgg cctacgccga tgcggccgag      480
gcacgaggca cctgggacag ccgatggag gccagcgtgg tggacgcggg ggtacgcggc      540
gacaccggtc ccgagctgct gtcccgggcg gccgcgtga attgggacac caccgcgcgc      600
gcgaccgtac tggtggggaa tccggcgccc ggtccaaatg gtcacaacag cgacggcgac      660
agcgagcggg ccagccagga tgtccgcgac accgcggctc gccacggccg cgctgcgctg      720
accgacgtgc acggcacctg gctgggtggc atcgtctccg gccagctgtc gccaaccgag      780
aagttcctca aagacctgct ggcagcatte gccgacgccc cggtggtcat cggccccacg      840
gcgcccattg tgaccgcggc gcaccgcagc gctagcgagg cgatctccgg gatgaacgcc      900
gtcgccgggt ggcgcgggag gccgcggccc gtgctggcta gggaactttt gccgaacgc      960
gccctgatgg gcgacgcctc ggcgatcgtg gccctgcata ccgacgtgat gcggccccta     1020
gccgatgccg gaccgacgct catcgagacg ctagacgcat atctggattg tggcggcgcg     1080
attgaagctt gtgccagaaa gttgttcggt catccaaaca cagtgcggta ccggtcaag     1140
cggatcacgg acttcaccgg gcgcgatccc acccagccac gcgatgccta tgtccttcgg     1200

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-187-

gtggcgccca ccgtgggtca actcaactat ccgacgccgc ac

1242

<210> 153

<211> 312

<212> PRT

<213> Mycobacterium tuberculosis

<400> 153

Met Pro Leu Ser Ser Arg Met Pro Gly Leu Thr Cys Phe Glu Ile Phe
 1 5 10 15

Leu Ala Ile Ala Glu Ala Gly Ser Leu Gly Gly Ala Ala Arg Glu Leu
 20 25 30

Gly Leu Thr Gln Gln Ala Val Ser Arg Arg Leu Ala Ser Met Glu Ala
 35 40 45

Gln Ile Gly Val Arg Leu Ala Ile Arg Thr Thr Arg Gly Ser Gln Leu
 50 55 60

Thr Pro Ala Gly Ile Val Val Ala Glu Trp Ala Ala Arg Leu Leu Glu
 65 70 75 80

Val Ala Asp Glu Ile Asp Ala Gly Leu Gly Ser Leu Arg Thr Glu Gly
 85 90 95

Arg Gln Arg Ile Arg Val Val Ala Ser Gln Thr Ile Ala Glu Gln Leu
 100 105 110

Met Pro His Trp Met Leu Ser Leu Arg Ala Ala Asp Met Arg Arg Gly
 115 120 125

Gly Thr Val Pro Glu Val Ile Leu Thr Ala Thr Asn Ser Glu His Ala
 130 135 140

Ile Ala Ala Val Arg Asp Gly Ile Ala Asp Leu Gly Phe Ile Glu Asn
 145 150 155 160

Pro Cys Pro Pro Thr Gly Leu Gly Ser Val Val Val Ala Arg Asp Glu
 165 170 175

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Leu Val Val Val Val Pro Pro Gly His Lys Trp Ala Arg Arg Ser Arg
 180 185 190

Val Val Ser Ala Arg Glu Leu Ala Gln Thr Pro Leu Val Thr Arg Glu
 195 200 205

Pro Asn Ser Gly Ile Arg Asp Ser Leu Thr Ala Ala Leu Arg Asp Thr
 210 215 220

Leu Gly Glu Asp Met Gln Gln Ala Pro Pro Val Leu Glu Leu Ser Ser
 225 230 235 240

Ala Ala Ala Val Arg Ala Ala Val Leu Ala Gly Ala Gly Pro Ala Ala
 245 250 255

Met Ser Arg Leu Ala Ile Ala Asp Asp Leu Ala Phe Gly Arg Leu Leu
 260 265 270

Ala Val Asp Ile Pro Ala Leu Asn Leu Arg Arg Gln Leu Arg Ala Ile
 275 280 285

Trp Val Gly Gly Arg Thr Pro Pro Ala Gly Ala Ile Arg Asp Leu Leu
 290 295 300

Ser His Ile Thr Ser Arg Ser Thr
 305 310

<210> 154

<211> 936

<212> DNA

<213> Mycobacterium tuberculosis

<400> 154
 atgccgctca gctctcgat gcccgactc acctgcttcg aaatctttct ggccatcgct 60
 gaggccggca gtcttggcgg cgccgcacgc gaactcgggt tgactcaaca agctgtgtca 120
 aggcggctcg catcgatgga ggccagatc ggggtgcat tggccatccg gacgacacgt 180
 ggctcccaac tcacgcctgc cggcatcgtc gtcgccgaat gggcggcccg cttgctcgaa 240
 gtcgccgacg agatcgatgc cggcctcggc tcgctgcgca ccgaaggccg ccagcgcac 300
 agagtgggtg ccagccagac gatagccgaa cagctgatgc cgcattggat gctgtccttg 360

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cgggcccgcg acatgcgccg cgggtgtact gtccctgagg taatcctgac cgccaccaat 420
 agcgagcatg cgatcgagc cgttcgtgac ggcacgcag atcttgatt catcgaaaac 480
 ccctgtctc ccacgggatt aggcagcgtt gtggttcac gcgacgaact ggtcgctcgtc 540
 gtgcccgcg gtcacaagtg ggcccgcg tcacgagtag tgagcgcccg ggagctcgct 600
 cagacgcctt tggtgactcg cgaaccgaac tctggcatcc gcgattcact caccgcggcg 660
 ttacgtgaca cgctcgggga ggacatgcag caagcgccac cggtgctgga attatcatcg 720
 gctgcggccg tcggggccgc ggtcttgcc ggcgctggac cggctgcgat gagccggcta 780
 gcgatagccg atgacctggc gttcggtcga ttactcgcg tcgacatccc cgcgttgaa 840
 ctgcggcgcc agcttcgagc catctgggtc ggtggcgca ccccgccggc gggtgcgata 900
 cgagacctgc tcagccacat cacttcccgc agcacg 936

<210> 155

<211> 74

<212> PRT

<213> Mycobacterium tuberculosis

<400> 155

Val Asn Pro Gly Phe Asp Ala Val Asp Gln Glu Thr Ala Ala Ala Gln
 1 5 10 15

Ala Val Ala Asp Ala His Gly Val Pro Phe Leu Gly Ile Arg Gly Met
 20 25 30

Ser Asp Gly Pro Gly Asp Pro Leu His Leu Pro Gly Phe Pro Val Gln
 35 40 45

Phe Phe Val Tyr Lys Gln Ile Ala Ala Asn Asn Ala Ala Arg Val Thr
 50 55 60

Glu Ala Phe Leu Gln Asn Trp Ala Gly Val
 65 70

<210> 156

<211> 222

<212> DNA

-190-

<213> Mycobacterium tuberculosis

<400> 156

```

gtgaaccccg gcttcgacgc ggttgaccag gagacggcag ccgcgcaggc ggtcgccgat      60
gcacaaggcg tcccgttcct gggaattcgc ggtatgtccg acgggcccgg cgacccgctg      120
catctgccgg gcttccccgt ccagttcttc gtttacaagc agattgcggc caacaacgcc      180
gcccgggtca ccgaagcctt cctgcagaac tgggcccggcgc tc                        222

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<210> 157

<211> 114

<212> PRT

<213> Mycobacterium tuberculosis

<400> 157

```

Val Val Ala Ala Leu His Ala Gly Lys Ala Val Thr Ile Ala Pro Gln
1              5              10              15

Ser Met Thr Leu Thr Thr Gln Gln Ala Ala Asp Leu Leu Gly Val Ser
          20              25              30

Arg Pro Thr Val Val Arg Leu Ile Lys Ser Gly Glu Leu Ala Ala Glu
          35              40              45

Arg Ile Gly Asn Arg His Arg Leu Val Leu Asp Asp Val Leu Ala Tyr
          50              55              60

Arg Glu Ala Arg Arg Gln Arg Gln Tyr Asp Ala Leu Ala Glu Ser Ala
65              70              75              80

Met Asp Ile Asp Ala Asp Glu Asp Pro Glu Val Ile Cys Glu Gln Leu
          85              90              95

Arg Glu Ala Arg Arg Val Val Ala Ala Arg Arg Arg Thr Glu Arg Arg
          100              105              110

Arg Ala

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<210> 158

<211> 342

<212> DNA

<213> Mycobacterium tuberculosis

<400> 158

```

gtggtggctg cgctgcacgc cggcaaggcg gtgaccatcg cgccgcagag catgacgctg      60
accacccagc aggccgccga ccttctcggg gtgagtcgtc cgaccgtggt gcgtctgata      120
aagagcggcg agctggccgc cgagcgcata gggaatcgcc accggctcgt gctcgacgac      180
gtgttggcct accgggaggg ccgccggcag cgccagtacg acgcgcttgc cgagagcgca      240
atggacatcg acgccgacga ggatcccagag gtgatttgcg agcagttgcy tgaggcgcgg      300
cgtgttgctg ccgcgcgccg tagaactgag cggcggcgcg cc                          342

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<210> 159

<211> 221

<212> PRT

<213> Mycobacterium tuberculosis

<400> 159

```

Met Thr Asn Leu Ala Asp Ala Thr Gln Ala Thr Met Ala Leu Val Glu
1          5          10          15
Arg His Ala Ala His Asn Tyr Ser Pro Leu Pro Val Val Ala Ala Ser
          20          25          30
Ala Glu Gly Ala Trp Ile Ala Asp Ile Asp Gly Leu Arg Tyr Leu Asp
          35          40          45
Trp Leu Ala Ala Tyr Ser Ala Val Asn Leu Gly His Arg Asn Pro Ala
          50          55          60
Ser Thr Ala Thr Ala His Ala Gln Val Asp Thr Val Thr Leu Leu Asn
65          70          75          80
Arg Ala Leu His Ala Asp Arg Leu Gly Pro Leu Gly Ala Ala Leu Ala
          85          90          95

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Gln Leu Cys Gly Lys Asp Val Val Leu Pro Met Asn Ser Asp Ala Glu
 100 105 110

Ala Val Glu Ser Gly Leu Arg Val Ala Arg Lys Trp Gly Ala Asp Val
 115 120 125

Asn Gly Leu Pro Ala Gly Arg His Asp Ile Ile Leu Ala Asn Asn Asn
 130 135 140

Phe His Gly His Thr Ser Ser Val Val Ser Phe Ser Ser Asp Pro Ala
 145 150 155 160

Ala Gly Ser Gly Val Glu Pro Ser Thr Pro Gly Leu Arg Ser Val Pro
 165 170 175

Phe Gly Asp Ala Ala Ala Pro Ala Gln Thr Ile Asp Asp Asn Thr Val
 180 185 190

Ala Asp Leu Leu Glu Pro Ile Pro Gly Gln Ala Gly Ile Ile Val Pro
 195 200 205

Ala Asp Asp Tyr Leu Pro Ala Ala Ser Ser Thr Thr Cys
 210 215 220

<210> 160

<211> 663

<212> DNA

<213> Mycobacterium tuberculosis

<400> 160

atgacaaatc tcgcggatgc cactcaggcc actatggcac tggtcgaaag gcatgcagcg 60
 cacaattatt cgccgctgcc tgtggtggcg gccagcgctg aggggtgcgtg gatcgccgat 120
 atcgacggcc tgcgctacct ggactggctg gctgcgtact cggcgggtcaa ccttggccat 180
 cgcaaccccg cgagcaccgc cacgggtcat gcccaagtcg acaccgtcac cctgctgaat 240
 cgggccttgc atgccgaccg actcggggcg ttggggcgccg cgcttgccca gctgtgcggc 300
 aaagacgtgg tgttgccaat gaactctgat gctgaagcgg tggagagcgg tcttagggtc 360
 gcccgcaagt ggggagccga cgtcaacggc ctccccgcgg gccggcacga tatcattttg 420

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gcaaacaaca actttcatgg ccacaccagc agtgtcgtca gcttctcgtc ggacccggct 480
 gcgggcagcg gcgtcgaacc ttctaccccg ggactccgct cggtagcggt tggcgatgct 540
 gcggcaccgg cgcagacaat cgacgacaac accgtcgtcg acctgctcga gccgattccc 600
 ggccaggcgg gcatcatcgt cccggccgac gactacctgc cggctgcgtc gagcacaacg 660
 tgc 663

<210> 161

<211> 302

<212> PRT

<213> Mycobacterium tuberculosis

<400> 161

Met Glu Asn Thr Gln Arg Pro Ser Phe Asp Cys Glu Ile Arg Ala Lys
 1 5 10 15

Tyr Arg Trp Phe Met Thr Asp Ser Tyr Val Ala Ala Ala Arg Leu Gly
 20 25 30

Ser Pro Ala Arg Arg Thr Pro Arg Thr Arg Arg Tyr Ala Met Thr Pro
 35 40 45

Pro Ala Phe Phe Ala Val Ala Tyr Ala Ile Asn Pro Trp Met Asp Val
 50 55 60

Thr Ala Pro Val Asp Val Gln Val Ala Gln Ala Gln Trp Glu His Leu
 65 70 75 80

His Gln Thr Tyr Leu Arg Leu Gly His Ser Val Asp Leu Ile Glu Pro
 85 90 95

Ile Ser Gly Leu Pro Asp Met Val Tyr Thr Ala Asn Gly Gly Phe Ile
 100 105 110

Ala His Asp Ile Ala Val Val Ala Arg Phe Arg Phe Pro Glu Arg Ala
 115 120 125

Gly Glu Ser Arg Ala Tyr Ala Ser Trp Met Ser Ser Val Gly Tyr Arg
 130 135 140

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Pro Val Thr Thr Arg His Val Asn Glu Gly Gln Gly Asp Leu Leu Met
 145 150 155 160

Val Gly Glu Arg Val Leu Ala Gly Tyr Gly Phe Arg Thr Asp Gln Arg
 165 170 175

Ala His Ala Glu Ile Ala Ala Val Leu Gly Leu Pro Val Val Ser Leu
 180 185 190

Glu Leu Val Asp Pro Arg Phe Tyr His Leu Asp Thr Ala Leu Ala Val
 195 200 205

Leu Asp Asp His Thr Ile Ala Tyr Tyr Pro Pro Ala Phe Ser Thr Ala
 210 215 220

Ala Gln Glu Gln Leu Ser Ala Leu Phe Pro Asp Ala Ile Val Val Gly
 225 230 235 240

Ser Ala Asp Ala Phe Val Phe Gly Leu Asn Ala Val Ser Asp Gly Leu
 245 250 255

Asn Val Val Leu Pro Val Ala Ala Met Gly Phe Ala Ala Gln Leu Arg
 260 265 270

Ala Ala Gly Phe Glu Pro Val Gly Val Asp Leu Ser Glu Leu Leu Lys
 275 280 285

Gly Gly Gly Ser Val Lys Cys Cys Thr Leu Glu Ile His Pro
 290 295 300

<210> 162

<211> 906

<212> DNA

<213> Mycobacterium tuberculosis

<400> 162

atggaaaata cgcaacgacc atcgtttgat tgtgaaatca gagccaaata tcgttggttt 60

atgacggatt cctacgtcgc tgetgcccgt ctagggtcac ctgcacgccc cccccccgg 120

acgcggcggt atgcaatgac cccgcgggcc ttctttgccg tcgcatacgc gatcaacccc 180

tggatggacg tcaccgcgcc agtcgacgtc caagtcgcgc aagcacagtg ggagcacctc 240

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caccagacct atcttcggct aggccacagc gtggatctga tcgagcccat ttccggggtta 300
 ccggacatgg tgtacaccgc caacggtggg ttcacgcgc acgacatcgc cgtgggtcgcc 360
 cggttccgggt tccccgaacg agctggtgag tctagagcct atgccagctg gatgtcctcg 420
 gtcggatatc gcccggtgac cacccgccac gtcaacgagg gacagggcga cctgctgatg 480
 gttggcgaaa ggggtgttggc gggctacggc ttctgcacag accagcgcgc acacgccgaa 540
 atcgccgcgg tgcttggtct gccggtggtc tccctcgagt tggtcgaccc acggttctat 600
 cacctggaca ccgcgctggc cgtgctcgac gaccacacga tcgcctacta cccgccggcg 660
 ttcagtacgg cagcgcagga acagttgtcg gcgctgttcc ccgacgcgat tgtggtcggc 720
 agtgccgacg cgttcgtggt cggactcaac gccgtctctg acggtctgaa cgtagtgttt 780
 ccggtcgcgg ccatggggttt tgcggcgagc ttacgcgcag ccggcttcga gccggtcggg 840
 gtcgatctgt ccgagctgct caagggcggc ggttccgtca agtgctgcac gctggagata 900
 caccca 906

<210> 163

<211> 652

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 163

Met Val Glu Ser Gly Thr Gly Ile Pro Leu Pro Ala Ser Cys Trp Ser
 1 5 10 15

Arg Thr Arg Ser Arg Arg Cys Met Pro Lys Asp Ser Ser Pro His Trp
 20 25 30

Ile Trp His Ser Ser Ala Ala Arg Ala Ala Leu Tyr Val Arg Gly Lys
 35 40 45

Arg Arg Pro Asp Gly Gln Gly Arg Arg Ser Cys Ala Leu Arg Asn Arg
 50 55 60

Gly Arg Thr Pro Ala Thr Gly Pro Gly Pro Gly Gln Ser Pro Ser Pro
 65 70 75 80

Val Gly Ala Arg Gln Pro Ala Leu Pro Ser Arg Arg Pro Leu Asn Pro

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	85		90		95
Ala Arg Ser Arg Thr Glu Val Val Met Ser Asp Ala Arg Val Pro Arg	100	105	110		
Ile Pro Ala Ala Leu Ser Ala Pro Ser Leu Asn Arg Gly Val Gly Phe	115	120	125		
Thr His Ala Gln Arg Arg Arg Leu Gly Leu Thr Gly Arg Leu Pro Ser	130	135	140		
Ala Val Leu Thr Leu Asp Gln Gln Ala Glu Arg Val Trp His Gln Leu	145	150	155	160	
Gln Ser Leu Ala Thr Glu Leu Gly Arg Asn Leu Leu Leu Glu Gln Leu	165	170	175		
His Tyr Arg His Glu Val Leu Tyr Phe Lys Val Leu Ala Asp His Leu	180	185	190		
Pro Glu Leu Met Pro Val Val Tyr Thr Pro Thr Val Gly Glu Ala Ile	195	200	205		
Gln Arg Phe Ser Asp Glu Tyr Arg Gly Gln Arg Gly Leu Phe Leu Ser	210	215	220		
Ile Asp Glu Pro Asp Glu Ile Glu Glu Ala Phe Asn Thr Leu Gly Leu	225	230	235	240	
Gly Pro Glu Asp Val Asp Leu Ile Val Cys Thr Asp Ala Glu Ala Ile	245	250	255		
Leu Gly Ile Gly Asp Trp Gly Val Gly Gly Ile Gln Ile Ala Val Gly	260	265	270		
Lys Leu Ala Leu Tyr Thr Ala Gly Gly Gly Val Asp Pro Arg Arg Cys	275	280	285		
Leu Ala Val Ser Leu Asp Val Gly Thr Asp Asn Glu Gln Leu Leu Ala	290	295	300		
Asp Pro Phe Tyr Leu Gly Asn Arg His Ala Arg Arg Arg Gly Arg Glu	305	310	315	320	

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Tyr Asp Glu Phe Val Ser Arg Tyr Ile Glu Thr Ala Gln Arg Leu Phe
325 330 335

Pro Arg Ala Ile Leu His Phe Glu Asp Phe Gly Pro Ala Asn Ala Arg
340 345 350

Lys Ile Leu Asp Thr Tyr Gly Thr Asp Tyr Cys Val Phe Asn Asp Asp
355 360 365

Met Gln Gly Thr Gly Ala Val Val Leu Ala Ala Val Tyr Ser Gly Leu
370 375 380

Lys Val Thr Gly Ile Pro Leu Arg Asp Gln Thr Ile Val Val Phe Gly
385 390 395 400

Ala Gly Thr Ala Gly Met Gly Ile Ala Asp Gln Ile Arg Asp Ala Met
 , 405 410 415

Val Ala Asp Gly Ala Thr Leu Glu Gln Ala Val Ser Gln Ile Trp Pro
420 425 430

Ile Asp Arg Pro Gly Leu Leu Phe Asp Asp Met Asp Asp Leu Arg Asp
435 440 445

Phe Gln Val Pro Tyr Ala Lys Asn Arg His Gln Leu Gly Val Ala Val
450 455 460

Gly Asp Arg Val Gly Leu Ser Asp Ala Ile Lys Ile Ala Ser Pro Thr
465 470 475 480

Ile Leu Leu Gly Cys Ser Thr Val Tyr Gly Ala Phe Thr Lys Glu Val
485 490 495

Val Glu Ala Met Thr Ala Ser Cys Lys His Pro Met Ile Phe Pro Leu
500 505 510

Ser Asn Pro Thr Ser Arg Met Glu Ala Ile Pro Ala Asp Val Leu Ala
515 520 525

Trp Ser Asn Gly Arg Ala Leu Leu Ala Thr Gly Ser Pro Val Ala Pro
530 535 540

Val Glu Phe Asp Glu Thr Thr Tyr Val Ile Gly Gln Ala Asn Asn Val
545 550 555 560

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Leu Ala Phe Pro Gly Ile Gly Leu Gly Val Ile Val Ala Gly Ala Arg
565 570 575

Leu Ile Thr Arg Arg Met Leu His Ala Ala Ala Lys Ala Ile Ala His
580 585 590

Gln Ala Asn Pro Thr Asn Pro Gly Asp Ser Leu Leu Pro Asp Val Gln
595 600 605

Asn Leu Arg Ala Ile Ser Thr Thr Val Ala Glu Ala Val Tyr Arg Ala
610 615 620

Ala Val Gln Asp Gly Val Ala Ser Arg Thr His Asp Asp Val Arg Gln
625 630 635 640

Ala Ile Val Asp Thr Met Trp Leu Pro Ala Tyr Asp
645 650

<210> 164

<211> 1956

<212> DNA

<213> Mycobacterium tuberculosis

<400>	164						
atggttgagt	cgggaaaccgg	gatcccccta	ccggcttcct	gctggagccg	gacgagatcg		60
aggcgatgca	tgccgaagga	ttcctcgccg	cactggatct	ggcactcttc	tgcggccagg		120
gcagcgctgt	acgttcgcgg	caaacgccga	cccgatggcc	aagggcgctg	atcgtgcgct		180
ctgcgaaatc	gtggccgaac	gccggcaact	ggacctggac	ctggccaaag	cccaagtccg		240
gtcggcgctc	gccaaaccagc	gttaccatcg	cgacgtccat	taaaccagc	acggtcacga		300
acggaggttg	tgatgagcga	cgcccgctg	ccacggatcc	cggccgcgtt	gtccgcacca		360
agtctcaacc	gtggagtcgg	cttcacccac	gcgcagcggc	ggcggctggg	gctgaccggc		420
cggcttccgt	cggccgtgt	cacgctcgac	caacaggccg	aacgcgtatg	gcatacgttg		480
cagagcttgg	ccaccgagct	gggccgcaac	ctgcttctcg	aacagctgca	ctaccgccac		540
gaggtgctgt	acttcaaggt	gctggccgac	catttgcccg	aactgatgcc	ggtggtgtac		600
acgcccaccg	ttggcgaggc	aatccaacgc	ttctccgacg	aataccgcgg	gcaacgcgga		660

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ctgtttctga gcatcgacga acccgacgaa atcgaggaag ccttcaacac gttggggctg 720
 gggcccagagg acgtcgacct gatcgtgtgc accgatgccg aggcgacccct gggatcgggt 780
 gactgggggtg tgggtggcat ccagatcgct gtgggcaaatt tggccctcta caccgccggc 840
 ggcggcgctcg atccgcgccg ctgcctcgcg gtgtctcttg atgtcggcac cgacaatgag 900
 cagctgctgg ccgatccgtt ctatctgggc aatcgccacg cccggcggcg cggtcgggaa 960
 tacgacgagt tcgtcagtcg ctatatcgaa acggctcaac gggtatttcc gcgtgccatt 1020
 ctgcatttcg aggacttcgg gccggcgaac gcgcggaaga tcctagacac atacggcacg 1080
 gattactgcg tgttcaacga tgacatgcaa ggaaccggcg cggtggtctt ggccgcgta 1140
 tacagcggtc tgaaggttac cggtatcccg ctgcgcgacg agacaatagt cgtcttcggc 1200
 gcaggcaccg cagggatggg gatcgccgat cagatccggg acgcgatggg ggcagacggg 1260
 gccacgctcg agcaggcggg gtcccagatc tggccgatcg acaggccggg cctgttggtc 1320
 gacgacatgg atgacctcg cgacttccaa gtgccgtacg cgaaaaaccg ccaccagctc 1380
 ggtgtggccg tcgggggatcg ggtcgggctg agcgacgcga tcaagatcgc atcgcccact 1440
 atcctgctcg gctgctcaac ggtctacgga gcgttcacca aagaggtggg cgaggcgatg 1500
 acggcgctct gcaaacaccc gatgatcttt ccgctgtcca acccgacgct gcgcatggaa 1560
 gccatccccg ccgacgtgct ggcgtggctg aatggcaggg cgctgcttgc caccggcagc 1620
 ccagtcgccc cagtgggaatt cgacgaaacc acctacgtca tcggtcaggc caacaacgtg 1680
 ttggcgtttc ccggcatcgg actgggcgct attgtcgtg gtgcccgggt gataaccagg 1740
 cgcgtgctgc atgcagcagc gaaggccatt gcgcaccagg ccaatccgac aaatcccga 1800
 gactcgctgt tgccggatgt ccaaaatctg cgggccatct cgacaacggg cgccgaagct 1860
 gtctatcggg ccgccgtcca agacggggtg gcttccagga cgcacgacga cgtcaggcag 1920
 gccatagtcg acaccatgtg gctcccgga tatgac 1956

<210> 165

<211> 356

<212> PRT

<213> Mycobacterium tuberculosis

<400> 165

Met Leu Ser Leu Thr Leu Ser Glu Ala Ser Cys Ile Ala Ser Ala Ser

-200-

1	5	10	15
Arg Trp Arg His Ile Ile Pro Ala Gly Val Val Cys Ala Leu Ile Ala	20	25	30
Gly Ile Gly Val Gly Cys His Gly Gly Pro Ser Asp Val Val Gly Arg	35	40	45
Ala Gly Pro Asp Arg Ala His Thr Ser Ile Thr Leu Val Ala Tyr Ala	50	55	60
Val Pro Glu Pro Gly Trp Ser Ala Val Ile Pro Ala Phe Asn Ala Ser	65	70	75
Glu Gln Gly Arg Gly Val Gln Val Ile Thr Ser Tyr Gly Ala Ser Ala	85	90	95
Asp Gln Ser Arg Gly Val Ala Asp Gly Lys Pro Ala Asp Leu Val Asn	100	105	110
Phe Ser Val Glu Pro Asp Ile Ala Arg Leu Val Lys Ala Gly Lys Val	115	120	125
Asp Lys Asp Trp Asp Ala Asp Ala Thr Lys Gly Ile Pro Phe Gly Ser	130	135	140
Val Val Thr Phe Val Val Arg Ala Gly Asn Pro Lys Asn Ile Arg Asp	145	150	155
Trp Asp Asp Leu Leu Arg Pro Gly Ile Glu Val Ile Thr Pro Ser Pro	165	170	175
Leu Ser Ser Gly Ser Ala Lys Trp Asn Leu Leu Ala Pro Tyr Ala Ala	180	185	190
Lys Ser Asp Gly Gly Arg Asn Asn Gln Ala Gly Ile Asp Phe Val Asn	195	200	205
Thr Leu Val Asn Glu His Val Lys Leu Arg Pro Gly Ser Gly Arg Glu	210	215	220
Ala Thr Asp Val Phe Val Gln Gly Ser Gly Asp Val Leu Ile Ser Tyr	225	230	235
			240

Glu Asn Glu Ala Ile Ala Thr Glu Arg Ala Gly Lys Pro Val Gln His
245 250 255

Ala Thr Ser Thr His Leu Gly Ala Ala Thr Ala Phe Arg Asn Phe Gln
275 280 285

Val Asp Pro Ala Val Ala Ala Asp Phe Ala Asp Leu Phe Pro Val Pro
305 310 315 320

Pro Gln Leu Phe Asp Lys Ala Thr Gly Ser Ile Thr Lys Ile Tyr Leu
340 345 350

<213> Mycobacterium tuberculosis

atgctctcct	tgacgctttc	tgaagcgagc	tgcacgccta	gcgcatcccc	ctggcgggcac	60
attatccctg	ccgggggtggt	gtgcgcattg	atcgccggta	tgggcgtggg	gtgtcatggc	120
ggtcccagcg	acgtggtcgg	ccgtgcggga	ccggaccgtg	cgcatacgag	catcaccctg	180
gtcgcctacg	ccgtcccgga	acccggctgg	agtgcggtga	ttcccgcgtt	caacgcttcc	240
gaacagggcc	ggggagtcca	ggtgattacc	tcatatggcg	cgtcggccga	ccagtcgcgc	300
ggtgttgccg	acggtaaacc	ggccgacctg	gtgaacttct	cggtcgaacc	ggacatcgct	360
cgcctggtca	aggccggcaa	ggttgacaag	gactgggacg	ccgatgccac	caagggcatc	420
ccgttcgggt	cggtggtgac	gtttgtggtc	cgcgcgggta	acccaagaa	catcagagat	480

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tgggatgacc tggtgcgccc gggatttgag gtcacacgc ccagtccgct gagttcgggt 540
 tctgccaagt ggaatctgct agccccctac gccgcgaaaa gtgacgggtg ccggaataac 600
 caagcgggga tcgactttgt caatacattg gtgaatgaac acgtcaaatt gcgccccggg 660
 tcggggcggg aagccaccga tgtttttgtc cagggcagcg gtgacgtgtt gatcagctac 720
 gagaacgaag ccatcgccac cgagcgggcg ggcaaaccgg tgcagcacgt caccgccg 780
 cagacgttca agatcgaaaa tccgttg gcc gtagtggcga ccagcacaca ccttggagcg 840
 gcgaccgcat tcagaaactt ccagtacacc gtgcaggcgc agaagttatg ggcgaggcc 900
 ggtttccggc cggtcgatcc ggcggtcgcc gccgattttg ccgacctgtt tccggtgccg 960
 gcgaaactgt ggacgatcgc cgacctcggg ggctggggca gcgtggatcc tcagctgttc 1020
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<210> 167

<211> 514

<212> PRT

<213> Mycobacterium tuberculosis

<400> 167

Met Gly Phe Gly Ala Ser Arg Leu Asp Val Arg Leu Val Pro Ala Ala
 1 5 10 15

Leu Val Ser Trp Ile Val Thr Ala Ala Gly Ile Val Trp Pro Ile Gly
 20 25 30

Asn Val Cys Ala Leu Cys Cys Val Val Val Ala Leu Gly Gly Gly Ala
 35 40 45

Leu Trp Trp Cys Val Ala Arg Arg Ser Trp His Ala Pro Arg Leu Gly
 50 55 60

Ser Ile Ser Ala Gly Leu Val Ala Val Gly Met Val Gly Ala Gly Tyr
 65 70 75 80

Gly Leu Ala Val Ala Leu Arg Ser Glu Ala Val Asp Arg His Pro Ile
 85 90 95

Thr Val Ala Phe Gly Thr Ser Ala Leu Val Thr Val Thr Pro Ser Glu

-203-

100	105	110
Ser Pro Val Ser Leu Gly Arg Gly Arg Leu Met Phe Arg Ala Thr Val 115	120	125
Gln Arg Leu Arg Asp Asp Glu Thr Ser Gly Arg Val Val Val Phe Ala 130	135	140
Arg Ala Leu Asp Phe Gly Glu Leu Met Val Gly Gln Pro Val Gln Phe 145	150	155 160
Arg Ala Arg Ile Ser Arg Pro Ala Arg His Asp Leu Thr Val Ala Val 165	170	175
Phe Asn Ala Thr Gly Arg Pro Thr Val Gly Arg Ala Gly Pro Val His 180	185	190
Arg Ala Ala His Ile Val Arg His Arg Phe Ala Ala Ala Val Arg Glu 195	200	205
Val Leu Pro Ala Asp Gln Ala Thr Met Leu Pro Ala Leu Val Leu Gly 210	215	220
Asp Thr Ser Thr Val Thr Ala Leu Thr Ser Arg Glu Phe Arg Ala Ala 225	230	235 240
Gly Leu Thr His Leu Thr Ala Val Ser Gly Ala Asn Val Thr Ile Val 245	250	255
Cys Ala Ala Ala Leu Val Ser Ala Arg Leu Ile Gly Pro Arg Ala Ala 260	265	270
Val Val Cys Ala Ala Val Ala Leu Val Ala Phe Val Ile Leu Val Gln 275	280	285
Pro Thr Ala Ser Val Leu Arg Ala Ala Val Met Gly Ala Ile Ala Leu 290	295	300
Val Gly Met Leu Ser Ala Arg Arg Arg Gln Ala Ile Pro Ala Leu Ser 305	310	315 320
Gly Ser Val Leu Val Leu Leu Ala Ala Ala Pro His Leu Ala Val Asp 325	330	335

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Ile Gly Phe Ala Leu Ser Val Ala Ala Thr Gly Ala Leu Val Val Ile
 340 345 350

Ala Pro Val Trp Ser Arg Arg Leu Val Asp Arg Gly Cys Pro Lys Val
 355 360 365

Leu Ala Asp Ala Leu Ala Val Ala Ala Ala Ala Gln Leu Val Thr Ala
 370 375 380

Pro Leu Val Ala Ala Ile Ser Gly Arg Val Ser Leu Val Ala Val Val
 385 390 395 400

Ala Asn Leu Ala Val Ala Ala Val Ile Ala Pro Ile Thr Val Leu Gly
 405 410 415

Ser Val Ala Ala Val Leu Val Val Pro Trp Pro Ala Gly Ala Gln Val
 420 425 430

Leu Ile Arg Phe Thr Gly Pro Glu Val Trp Trp Val Leu Arg Val Ala
 435 440 445

His Trp Ala Ser Gly Val Pro Ala Ala Thr Val Pro Val Ala Ala Gly
 450 455 460

Leu Pro Gly Val Leu Leu Val Gly Gly Ala Thr Val Phe Thr Val Ala
 465 470 475 480

Gln Trp Arg Trp Arg Trp Phe Arg Ala Ala Met Cys Lys Thr Met Ala
 485 490 495

Val Ala Val Ile Cys Leu Leu Ala Trp Ser Leu Ser Gly Leu Val Gly
 500 505 510

Pro Ser

<210> 168

<211> 1542

<212> DNA

<213> Mycobacterium tuberculosis

-205-

<400> 168
 atgggcttcg gcgcgtcccg tttggacgta cgcctgggtcc cggcggcgct ggtcagctgg 60
 attgtgacgg cggccgggat cgtgtggccg atcggcaacg tgtgtgcctt gtgctgcgtc 120
 gtggtggccc tcggcggcgg cgcactgtgg tgggtgtgtgg cgcgccggtc gtggcacgct 180
 ccgcgactgg gttcgatcag cgcgggcctg gtcgcgggtc gtatgggtggg cgcgggggtac 240
 gggcttgagg tcgcgttgcg ctccgaggcg gtcgatcgcc acccaatcac cgtggcattt 300
 ggcacctccg cgctggtcac ggtcaccccc agcgagagcc cagtgtcgct ggggcggggc 360
 cggttgatgt tccgggcgac ggttcaacgg ctgcgggatg acgagacatc cggccgggta 420
 gtggttttcg cgcgagcgt ggacttcggc gagctgatgg tcggacagcc cgtccagttc 480
 cgcgcgcgta tcagtcgccc ggcgcgtcac gacctgacgg tcgcggtgtt caatgcgacc 540
 ggtcggccga ccgtgggccc tgccggcccc gtacaccgcg ccgctcacat cgtccgccat 600
 cgattcgagg ccgcggttcg tgaggtgctg ccgctgacc aggccacgat gttgccggcc 660
 ctggttctcg gcgatacctc gacggtcacc gccttaacca gccgcgagtt ccgtgcggcg 720
 ggcctgacgc acttgacggc ggtctcgggg gccaatgtca cgatcgtgtg tcggcggcg 780
 ctggtttcgg cacggttgat cggaccgcgt gcggccgtgg tgtgcgcggc cgtcgcgttg 840
 gtggcattcg tcacctcgtt gcagccgacg gccagcgtgt tcggggcagc tgtgatgggc 900
 gccattgccc tcgtggggat gctgtctcg cgcgggcggc aggcgattcc agctttgtcg 960
 ggtagcgtgc tggttttgct ggctgccgt ccccatcttg ctgtggacat cggcttcgcg 1020
 ctgtccgtgg cggccacggg tgcaactggc gtcacgcgc cggtttggtc acgccgcttg 1080
 gtcgaccgcg gatgtccgaa ggtgctggcc gatgccctcg cagtcgcggc ggccgcgcag 1140
 ctggtgacgg cgccactggt ggccgccatc tccggccggg tcagtctggt ggccgtggtg 1200
 gccaatctgg cggtggcggc cgtgatcgcg ccgatcaccg tgctgggcag cgttgccggc 1260
 gtgctggtcg tgccgtggcc ggccggcgcg cagggtgctga tccggttcac cgggcccga 1320
 gtgtgggtgg tgttgccgt ggccgattgg gcgtcgggtg tgcccgcggc gaccgttccg 1380
 gtggccgcag gtctgcccgg cgtactgctg gtcgggtggc ccaccgtgtt cacggttgcg 1440
 cagtggcgct ggcgctggtt tcgcgcggcc atgtgcaaaa cgatggcggt ggccgtcata 1500
 tgtctgcttg cctggtcgct gtccgggctg gtcggccctt cg 1542

<210> 169

<211> 139

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<212> PRT

<213> Mycobacterium tuberculosis

<400> 169

Val Leu Gln Arg Thr Asn Val Val Gln Pro Leu Asn Thr Leu Arg Met
1 5 10 15

Val Trp Ile Gln Val Ala Gly Ile Ile Pro Ala Thr Ala Gly Ile Ala
20 25 30

Ala Thr Val Tyr Ala Gln Leu Ala Met Gly Asp Ser Trp Arg Ile Gly
35 40 45

Val Asp Glu Gln Glu Asn Thr Thr Leu Val Arg Thr Gly Pro Phe Lys
50 55 60

Trp Val Arg His Pro Ile Tyr Thr Ala Met Met Ala Phe Gly Leu Gly
65 70 75 80

Leu Leu Leu Val Thr Pro Asn Leu Val Ala Leu Ala Gly Phe Ile Leu
85 90 95

Leu Val Ala Thr Leu Glu Val His Val Arg Arg Val Glu Glu Pro Tyr
100 105 110

Leu Leu Arg Thr His Ser Ala Val Tyr Arg Gly Tyr Thr Ala Ser Val
115 120 125

Gly Arg Phe Val Pro Gly Val Gly Leu Ile Arg
130 135

<210> 170

<211> 417

<212> DNA

<213> Mycobacterium tuberculosis

<400> 170

gtgctgcagc ggaccaacgt tgtccaaccg ctgaatactc tgcgcatggt ctggattcag 60

ggtgcccggca taatccccgc gacggccggg atcgcggcca cggtttacgc ccagcttgcg 120

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atgggcgatt cgtggcggat cggggtggac gagcaggaga acaccactct ggtgocgacc 180
 ggcccgttta aatgggtgcg tcaccccatc tacacggcca tgatggcggt tggcctcggg 240
 ctggtgctgg tgactccgaa tctcgttgcc ctgcgcgggt ttatcctgct cgttgccacg 300
 ctcgaggtgc atgtccgccg cgtcgaagaa cctacctgt tgcggacgca cagtgcgcgtc 360
 taccgcggt acaccgccag cgtcggccgg ttcgtcccgg gtgtgggggt gatccgc 417

<210> 171

<211> 161

<212> PRT

<213> Mycobacterium tuberculosis

<400> 171

Val Val Gly His Ile Val Asn Asp Leu Gln Arg Arg Lys Val Gly Asp
 1 5 10 15

Gln Glu Val Val Lys Phe Arg Val Ala Ser Asn Ser Arg Arg Arg Thr
 20 25 30

Ser Asp Gly Gly Trp Glu Pro Gly Asn Ser Leu Phe Ile Thr Val Asn
 35 40 45

Cys Trp Gly Arg Leu Val Thr Gly Val Gly Ala Ala Leu Gly Lys Gly
 50 55 60

Ala Pro Val Ile Val Val Gly His Val Tyr Thr Ser Glu Tyr Glu Asp
 65 70 75 80

Arg Asp Gly Ile Arg Arg Ser Ser Leu Glu Met Arg Ala Thr Ser Val
 85 90 95

Gly Pro Asp Leu Ser Arg Val Ile Val Arg Ile Glu Lys Pro Ala Tyr
 100 105 110

Thr Gly Pro Ser Ala Gly Asp Leu Pro Ala Ala Thr Gly Thr Gly Ala
 115 120 125

Ala Gly Ala Ala Asp Ala Pro Ala Ser Ala Ala Asp Ser Val Ser Asp
 130 135 140

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Val Val Val Asp Asp Ala Ile Thr Gly His Asn Pro Leu Pro Ile Ser
 145 150 155 160

Ala

<210> 172

<211> 483

<212> DNA

<213> Mycobacterium tuberculosis

<400> 172

gtgggtcggtc acatcgtcaa cgatttgcag cgccgcaaag tcggtgatca agaggtcgtc 60
 aagttccggg tggccagcaa ttcgcgcggc cgcaccagcg acggcggttg ggagcccggc 120
 aactcgctgt ttatcacgt caattgctgg ggaaggctgg tcaccggggt gggcgcagca 180
 ttgggcaagg gcgcaccggt gattgtggtg ggacacgtgt acaccagtga atatgaggac 240
 cgggacggca ttcgtcgctc gtcgctggag atgcgggcga cgtcggtagg gccggatttg 300
 tcgcgcgtga tcgtgcgcat cgaaaagccg gcctacaccg gtccaagcgc cggatgatctc 360
 ccggccgcca cggggaccgg ggcggccggt gccgccgacg cccagcgtc ggcagccgac 420
 tcggtttccg atgtcgtggt cgacgacgcc atcactggcc acaaccccct gcccatatcg 480
 gct 483

<210> 173

<211> 256

<212> PRT

<213> Mycobacterium tuberculosis

<400> 173

Met Ala Gln Tyr Asp Pro Val Leu Leu Ser Val Asp Lys His Val Ala
 1 5 10 15

Leu Ile Thr Val Asn Asp Pro Asp Arg Arg Asn Ala Val Thr Asp Glu
 20 25 30

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Met Ser Ala Gln Leu Arg Ala Ala Ile Gln Arg Ala Glu Gly Asp Pro
 35 40 45

Asp Val His Ala Val Val Val Thr Gly Ala Gly Lys Ala Phe Cys Ala
 50 55 60

Gly Ala Asp Leu Ser Ala Leu Gly Ala Gly Val Gly Asp Pro Ala Glu
 65 70 75 80

Pro Arg Leu Leu Arg Leu Tyr Asp Gly Phe Met Ala Val Ser Ser Cys
 85 90 95

Asn Leu Pro Thr Ile Ala Ala Val Asn Gly Ala Ala Val Gly Ala Gly
 100 105 110

Leu Asn Leu Ala Leu Ala Ala Asp Val Arg Ile Ala Gly Pro Ala Ala
 115 120 125

Leu Phe Asp Ala Arg Phe Gln Lys Leu Gly Leu His Pro Gly Gly Gly
 130 135 140

Ala Thr Trp Met Leu Gln Arg Ala Val Gly Pro Gln Val Ala Arg Ala
 145 150 155 160

Ala Leu Leu Phe Gly Met Cys Phe Asp Ala Glu Ser Ala Val Arg His
 165 170 175

Gly Leu Ala Leu Met Val Ala Asp Asp Pro Val Thr Ala Ala Leu Glu
 180 185 190

Leu Ala Ala Gly Pro Ala Ala Ala Pro Arg Glu Val Val Leu Ala Ser
 195 200 205

Lys Ala Thr Met Arg Ala Thr Ala Ser Pro Gly Ser Leu Asp Leu Glu
 210 215 220

Gln His Glu Leu Ala Lys Arg Leu Glu Leu Gly Pro Gln Ala Lys Ser
 225 230 235 240

Val Gln Ser Pro Glu Phe Ala Ala Arg Leu Ala Ala Ala Gln His Arg
 245 250 255

<210> 174

-210-

<211> 768

A

<212> DNA

<213> Mycobacterium tuberculosis

<400> 174

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atggcccaat acgacccggt cttgctcagc gtcgacaagc acgttgcgct catcacggtc      60
aacgacccgg accgacggaa cgccgtcacc gacgagatgt cggcgcagtt gcgtgcggcg      120
atccaacgcg ccgaaggcga ccccgacgta cagcccgtag tcgtgaccgg ggcgggcaag      180
gccttctgcg ccggggccga cctgagtgcg ctgggcgcgc gggtcggcga tccagccgag      240
ccgagattgt tacggctcta cgacggtttc atggccgtca gtagttgtaa tctgcccacc      300
atcgccgcgg tcaacggcgc ggctgtgggc gccggactca atctggcggt ggccgccgat      360
gtgcgcatcg ccggaccggc cgcattgttc gacgcccgct tccaaaagct gggactgcat      420
ccagggtggc gcgcaacctg gatgctgcag cgagcggtag gtccgcaggt cggccgtgcg      480
gccttattgt tcggcatgtg cttcgacgcc gaatccgctg tgcggcacgg cttggcgcta      540
atggttgccg acgatcccgt caccgcggcg ctggagctgg ccgccggggc cgcagccgcc      600
ccgcgcgagg tcgtgctggc gagcaaagcc accatgcgcg ccacagccag ccccggatcg      660
ctggaccttg agcaacacga actcgccaaa cgcttagaac ttgggcccga ggcgaaatcg      720
gtccagtcgc ccgagttcgc cgctcgcttg gctgccgctc aacacagg                    768

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<210> 175

<211> 547

<212> PRT

<213> Mycobacterium tuberculosis

<400> 175

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Val Ala Ala Ala Glu Val Val Asp Pro Asn Arg Leu Ser Tyr Asp Arg
1           5           10           15

Gly Pro Ser Ala Pro Ser Leu Leu Glu Ser Thr Ile Gly Ala Asn Leu
20           25           30

Ala Ala Thr Ala Ala Arg Tyr Gly His Arg Glu Ala Leu Val Asp Met
35           40           45

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Val Ala Arg Arg Arg Phe Asn Tyr Ser Glu Leu Leu Thr Asp Val His
 50 55 60

Arg Leu Ala Thr Gly Leu Val Arg Ala Gly Ile Gly Pro Gly Asp Arg
 65 70 75 80

Val Gly Ile Trp Ala Pro Asn Arg Trp Glu Trp Val Leu Val Gln Tyr
 85 90 95

Ala Thr Ala Glu Ile Gly Ala Ile Leu Val Thr Ile Asn Pro Ala Tyr
 100 105 110

Arg Val Arg Glu Val Glu Tyr Ala Leu Arg Gln Ser Gly Val Ala Met
 115 120 125

Val Ile Ala Val Ala Ser Phe Lys Asp Ala Asp Tyr Ala Ala Met Leu
 130 135 140

Ala Glu Val Gly Pro Arg Cys Pro Asp Leu Ala Asp Val Ile Leu Leu
 145 150 155 160

Glu Ser Asp Arg Trp Asp Ala Leu Ala Gly Ala Glu Pro Asp Leu Pro
 165 170 175

Ala Leu Gln Gln Thr Ala Ala Arg Leu Asp Gly Ser Asp Pro Val Asn
 180 185 190

Ile Gln Tyr Thr Ser Gly Thr Thr Ala Tyr Pro Lys Gly Val Thr Leu
 195 200 205

Ser His Arg Asn Ile Leu Asn Asn Gly Tyr Leu Val Gly Glu Leu Leu
 210 215 220

Gly Tyr Thr Ala Gln Asp Arg Ile Cys Ile Pro Val Pro Phe Tyr His
 225 230 235 240

Cys Phe Gly Met Val Met Gly Asn Leu Ala Ala Thr Ser His Gly Ala
 245 250 255

Ala Met Val Ile Pro Ala Pro Gly Phe Asp Pro Ala Ala Thr Leu Arg
 260 265 270

Ala Val Gln Asp Glu Arg Cys Thr Ser Leu Tyr Gly Val Pro Thr Met

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275	280	285
Phe Ile Ala Glu Leu Gly	Leu Pro Asp Phe Thr Asp Tyr Glu Leu Gly	
290	295	300
Ser Leu Arg Thr Gly	Ile Met Ala Gly Ala Ala Cys Pro Val Glu Val	
305	310	315
Met Arg Lys Val	Ile Ser Arg Met His Met Pro Gly Val Ser Ile Cys	
325	330	335
Tyr Gly Met Thr Glu Thr Ser Pro Val Ser Thr Gln Thr Arg Ala Asp		
340	345	350
Asp Ser Val Asp Arg Arg Val Gly Thr Val Gly Arg Val Gly Pro His		
355	360	365
Leu Glu Ile Lys Val Val Asp Pro Ala Thr Gly Glu Thr Val Pro Arg		
370	375	380
Gly Val Val Gly Glu Phe Cys Thr Arg Gly Tyr Ser Val Met Ala Gly		
385	390	395
Tyr Trp Asn Asp Pro Gln Lys Thr Ala Glu Val Ile Asp Ala Asp Gly		
405	410	415
Trp Met His Thr Gly Asp Leu Ala Glu Met Asp Pro Ser Gly Tyr Val		
420	425	430
Arg Ile Ala Gly Arg Ile Lys Asp Leu Val Val Arg Gly Gly Glu Asn		
435	440	445
Ile Ser Pro Arg Glu Ile Glu Glu Leu Leu His Thr His Pro Asp Ile		
450	455	460
Val Asp Gly His Val Ile Gly Val Pro Asp Ala Lys Tyr Gly Glu Glu		
465	470	475
Leu Met Ala Val Val Lys Leu Arg Asn Asp Ala Pro Glu Leu Thr Ile		
485	490	495
Glu Arg Leu Arg Glu Tyr Cys Met Gly Arg Ile Ala Arg Phe Lys Ile		
500	505	510

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Pro Arg Tyr Leu Trp Ile Val Asp Glu Phe Pro Met Thr Val Thr Gly
 515 520 525

Lys Val Arg Lys Val Glu Met Arg Gln Gln Ala Leu Glu Tyr Leu Arg
 530 535 540

Gly Gln Gln
 545

<210> 176

<211> 1641

<212> DNA

<213> Mycobacterium tuberculosis

<400> 176

gtggcagccg cggaagtcgt agaccccaat cggctttcct atgatcgagg tccgagtgcg 60
 ccatcattgc tcgagtcgac catcggcgcc aacctcgag cgaccgctgc caggtacgga 120
 catcgggaag cactcgtgga catggtggcc cggcgacggt tcaattacag cgaactgctg 180
 actgacgtgc accggctggc gacggggctg gtgcggggcg ggatcgggcc gggcgatcgg 240
 gtcggcatct gggcgccgaa ccggtgggag tgggtgctcg tccagtacgc gaccgctgag 300
 atcggcgcca tcctagtac cataaaccac gcctatcggg tccgcgaagt ggagtatgcg 360
 cttaggcagt ccggtgtcgc gatggtgatt gccgtagcga gtttcaagga tgcggactat 420
 gccgcgatgc tggccgaggt tgggcccgcga tgccccgatc tggccgacgt gatatttgcg 480
 gaaagcgatc gctgggacgc gctggcggt gccgagcccg atctgcctgc gctgcagcag 540
 accgcggcga ggctagacgg cagtgatccg gtaaacatcc aatacacctc cggcacaacg 600
 gcatacccca aggggtgtcac gctaagccac cgcaatatcc tcaacaacgg ctacctggtg 660
 ggcgagctgc tcgggtacac cgcacaagat cggatttgca tcccgggtgcc cttctaccac 720
 tgcttcggca tggtaatggg aaatctggcg gccaccagtc acggggcggc catggtgatc 780
 ccggcgcccg gctttgaccc tgcggccacg ctgcgcgcgg tgcaggacga gcgatgcacc 840
 agcttgtagc gcgtgccgac gatgttcac gccgagctgg gcctgccgga cttcaccgac 900
 tacgaactgg gcagtctgcg caccgggatt atggccggcg ccgcgtgccc ggtcgaggtg 960
 atgcgcaagg tgatctcacg catgcataatg cccgggggtct cgatctgcta tggaatgacc 1020
 gaaacgtcac cggtttccac gcagacgcgc gccgacgact cgggtggatcg acgggtcggc 1080

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acggtcggtc ggggtgggtcc acaccttgag atcaaggtgg tggatccggc cacgggcgag 1140
acggtcccgc gcgggggtggt cggcgagttc tgcaecgcgag gctattcggg gatggccggg 1200
tactggaatg acccgcagaa gactgcgag gtgatcgacg ccgacggctg gatgcacacc 1260
ggagatctgg ctgagatgga cccgtccggg tacgtgcgga tcgccggccg gatcaaagac 1320
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catcccgata ttgtcgacgg tcacgtcatc ggggtgcccg acgccaaata cggcgaagag 1440
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gagtactgca tgggccgcat cgcgcgattc aagatccgc ggtacctgtg gatcgtcgac 1560
gagttcccga tgaccgtcac cggcaaagta cgcaaagtgg agatgcgaca acaggcgctc 1620
gaatacctcc gcggccaaca g 1641

<210> 177

<211> 463

<212> PRT

<213> Mycobacterium tuberculosis

<400> 177

Val His Leu Ala His Arg Val Ala Ser Ser Arg Asp Thr Pro Ser Ser
1 5 10 15

Ser Ala Thr Pro Asn Ala Val Ser Gly Ser Ala Ser Asn Ala Ala Asp
20 25 30

Arg Pro Cys Leu Val Arg Pro Pro Thr Ala Pro Pro Trp Ala His Gly
35 40 45

Pro Arg Leu Arg Arg Asp Pro Thr Gly Gly Gly Ser Thr Pro Ser Ile
50 55 60

Val Leu Ser Arg Ser Thr Asp Arg Ser Lys Asp Gly His Arg Ile Val
65 70 75 80

Pro Ala Gly Ala Arg Lys Ser Gly Val Arg Ala Ser Thr Gly Arg Leu
85 90 95

Pro Ser Thr Arg Lys Thr Thr Arg Ser Pro Asp Cys Arg Pro Ser Ala

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100	105	110
Ser Arg Thr Ala Phe Gly Thr Val Thr Cys Pro Phe Asp Val Thr Met		
115	120	125
Gly Ser Ser Glu Cys Leu Leu His Arg Cys Arg Thr Pro Pro Val Pro		
130	135	140
Ser His Ser Val Glu Leu Leu Val Ala Ala Asn Pro Ala Glu Asp Ser		
145	150	155 160
Arg Leu Pro Tyr Leu Ile Arg Leu Pro Val Gly Ala Gly Leu Val Phe		
165	170	175
Ala Thr Ser Asp Val Trp Pro Arg Thr Lys Ala Leu Tyr Cys His Arg		
180	185	190
Leu Asp Ile Ala Asp Trp Pro Ala Asp Pro Val Val Val Asp Arg Val		
195	200	205
Glu Leu Arg Ser Cys Ser Arg Arg Gly Ala Ala Ile Asp Val Val Ala		
210	215	220
Ala Arg Ala Arg Glu Asn Arg Ser Gln Leu Val His Thr Met Ala Arg		
225	230	235 240
Gly Arg Gln Val Val Phe Trp Gln Ser Pro Lys Thr Arg Lys Gln Ser		
245	250	255
Arg Pro Gly Val Arg Thr Pro Thr Ala Arg Ala Ala Gly Ile Pro Glu		
260	265	270
Leu His Ile Val Val Asp Ala His Glu Arg Tyr Pro Tyr Thr Phe Ala		
275	280	285
Asp Lys Pro Ala Lys Thr Thr Arg Glu Ala Leu Pro Cys Gly Asp Tyr		
290	295	300
Gly Leu Lys Val Ala Gly Gln Leu Val Ala Ala Val Glu Arg Lys Ala		
305	310	315 320
Leu Ala Asp Leu Thr Ser Gly Val Leu Asn Gly Asn Leu Lys Tyr Gln		
325	330	335

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Leu Thr Glu Leu Ala Ala Leu Pro Arg Ala Ala Val Val Val Glu Asp
 340 345 350

Arg Tyr Ser Glu Ile Phe Ala His Ser Phe Ala Arg Pro Thr Ala Ile
 355 360 365

Ala Asp Gly Leu Ala Glu Leu Gln Ile Gly Phe Pro Asn Val Pro Ile
 370 375 380

Val Phe Cys Gln Thr Arg Lys Leu Ala Gln Glu Tyr Thr Tyr Arg Tyr
 385 390 395 400

Leu Ala Ala Ala Leu Thr Trp Phe Val Asp Asp Ala Asp Ala Thr Thr
 405 410 415

Val Phe Glu Pro Ala Ala Ala Glu Pro Glu Pro Ser Ser Ala Glu Leu
 420 425 430

Arg Ala Trp Ala Lys Ser Val Gly Leu Pro Val Ser Asp Arg Gly Arg
 435 440 445

Leu Arg Pro Gln Ile Leu Gln Ala Trp Arg Ala Ala His Pro Arg
 450 455 460

<210> 178

<211> 1389

<212> DNA

<213> Mycobacterium tuberculosis

<400> 178

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 accccctcga tcgtcttgag ccggtcgaca gaccgatcga aagacggcca ccggatcgtc 240
 ccggcagggg cgaggaagtc cggcgtccga gcaagcaccg ggcgattgcc ctcaacgcgg 300
 aagacaaccc gatcaccga ttgcaggccg agcgcgtcgc gcaccgcttt cggaaccgtc 360
 acctgcccct tcgacgtgac gatggggttcg tcggagtgcc tgcttcaccg ttgccgtacg 420
 ccgcccgtac cctcacactc tgtggagctg ctcgtcgccg ccaacccgc tgaagactcg 480

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cgctgccct acctgatccg gctgccggtg ggcgcgggac tggctttcgc cacctcagac 540
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 gaccccgctg tcgtcgaccg ggtcgagcta cgcagctgca gccgccgggg cgcgcccatc 660
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 gctgccgccc agcccagacc cagcagcgcc gagctgcgcg cgtgggcca aagcgtcggc 1320
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 catccccgg 1389

<210> 179

<211> 134

<212> PRT

<213> Mycobacterium tuberculosis

<400> 179

Val Ile Ala Pro Asp Thr Ser Val Leu Val Ala Gly Phe Ala Thr Trp
 1 5 10 15

His Glu Gly His Glu Ala Ala Val Arg Ala Leu Asn Arg Gly Val His
 20 25 30

Leu Ile Ala His Ala Ala Val Glu Thr Tyr Ser Val Leu Thr Arg Leu
 35 40 45

Pro Pro Pro His Arg Ile Ala Pro Val Ala Val His Ala Tyr Leu Ala

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50

55

60

Asp Ile Thr Ser Ser Asn Tyr Leu Ala Leu Asp Ala Cys Ser Tyr Arg
 65 70 75 80

Gly Leu Thr Asp His Leu Ala Glu His Asp Val Thr Gly Gly Ala Thr
 85 90 95

Tyr Asp Ala Leu Val Gly Phe Thr Ala Lys Ala Ala Gly Ala Lys Leu
 100 105 110

Leu Thr Arg Asp Leu Arg Ala Val Glu Thr Tyr Glu Arg Leu Arg Val
 115 120 125

Glu Val Glu Leu Val Thr
 130

<210> 180

<211> 402

<212> DNA

<213> Mycobacterium tuberculosis

<400> 180

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 gcctacttgg cggacatcac ctccagcaac tacctggcac tggatgcctg ctcatatcgc 240
 ggcttgaccg accacctcgc cgagcacgat gtcaccggtg gcgcaaccta cgatgccttg 300
 gtcggcttca cggcgaaagc tgccggcgca aagctgctga ctgcgcacct gcgcgcggtc 360
 gaaacgtacg agcgattgcg ggtcgaggtt gagctggtga cc 402

<210> 181

<211> 405

<212> PRT

<213> Mycobacterium tuberculosis

-219-

<400> 181

Val Thr Glu Asn Pro Tyr Leu Val Gly Leu Arg Leu Ala Gly Lys Lys
 1 5 10 15

Val Val Val Val Gly Gly Gly Thr Val Ala Gln Arg Arg Leu Pro Leu
 20 25 30

Leu Ile Ala Ser Gly Ala Asp Val His Val Ile Ala Pro Ser Val Thr
 35 40 45

Pro Ala Val Glu Ala Met Asp Gln Ile Thr Leu Ser Val Arg Asp Tyr
 50 55 60

Arg Asp Gly Asp Leu Asp Gly Ala Trp Tyr Ala Ile Ala Ala Thr Asp
 65 70 75 80

Asp Ala Arg Val Asn Val Ala Val Val Ala Glu Ala Glu Arg Arg Arg
 85 90 95

Ile Phe Cys Val Arg Ala Asp Ile Ala Val Glu Gly Thr Ala Val Thr
 100 105 110

Pro Ala Ser Phe Ser Tyr Ala Gly Leu Ser Val Gly Val Leu Ala Gly
 115 120 125

Gly Glu His Arg Arg Ser Ala Ala Ile Arg Ser Ala Ile Arg Glu Ala
 130 135 140

Leu Gln Gln Gly Val Ile Thr Ala Gln Ser Ser Asp Val Leu Ser Gly
 145 150 155 160

Gly Val Ala Leu Val Gly Gly Gly Pro Gly Asp Pro Glu Leu Ile Thr
 165 170 175

Val Arg Gly Arg Arg Leu Leu Ala Gln Ala Asp Val Val Val Ala Asp
 180 185 190

Arg Leu Ala Pro Pro Glu Leu Leu Ala Glu Leu Pro Pro His Val Glu
 195 200 205

Val Ile Asp Ala Ala Lys Ile Pro Tyr Gly Arg Ala Met Ala Gln Asp
 210 215 220

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Ala Ile Asn Ala Val Leu Ile Glu Arg Ala Arg Ser Gly Asn Phe Val
 225 230 235 240

Val Arg Leu Lys Gly Gly Asp Pro Phe Val Phe Ala Arg Gly Tyr Glu
 245 250 255

Glu Val Leu Ala Cys Ala His Ala Gly Ile Pro Val Thr Val Val Pro
 260 265 270

Gly Val Thr Ser Ala Ile Ala Val Pro Ala Met Ala Gly Val Pro Val
 275 280 285

Thr His Arg Ala Met Thr His Glu Phe Val Val Val Ser Gly His Leu
 290 295 300

Ala Pro Gly His Pro Glu Ser Leu Val Asn Trp Asp Ala Leu Ala Ala
 305 310 315 320

Leu Thr Gly Thr Ile Val Leu Leu Met Ala Val Glu Arg Ile Glu Leu
 325 330 335

Phe Val Asp Val Leu Leu Lys Gly Gly Arg Thr Ala Asp Thr Pro Val
 340 345 350

Leu Val Val Gln His Gly Thr Thr Ala Ala Gln Gln Thr Leu Arg Ala
 355 360 365

Thr Leu Ala Asp Thr Pro Glu Lys Val Arg Ala Ala Gly Ile Arg Pro
 370 375 380

Pro Ala Ile Ile Val Ile Gly Ala Val Val Gly Leu Ser Gly Val Arg
 385 390 395 400

Gly Leu Asn Asn Ser
 405

<210> 182

<211> 1215

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 182
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 gtgcgtgact accgcgacgg cgaccttgac ggcgcctggg atgcgatcgc ggccaccgat 240
 gacgcgcggg tgaacgtggc tgtcgtcgcc gaggcggagc gccgacggat cttttgctgc 300
 cgggccgata tcgcggtgga ggggacggcg gtgaccccg cgtcattcag ctatgcgggc 360
 ctgtcgggtg ggggtgctgc cgggtggtgag caccgccgtt cggcggcgat ccgctcggca 420
 atccgggagg cgttgcagca gggcgatc actgcgcaga gttccgacgt cctcagcggc 480
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 cggctgcttg cccaggccga tgtcgtgggc gccgaccggc tcgccccgcc cgaactgctg 600
 gccgagctgc cgcgcacgt agaagtcac gacgcggcca agatccctta cggccggggc 660
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 tgtgcccacg ccggaatccc ggtcaccgtg gtgbcagggtg tgacgagtgc catagccgtg 840
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 gggatccgac ctcccgcgat catcgtgatc ggggctgtag tcggcctgag cggcggttcgg 1200
 ggtttaaaca attct 1215

<210> 183

<211> 591

<212> PRT

<213> Mycobacterium tuberculosis

<400> 183

Met Pro Ala Pro Arg Met Pro Arg Val Ala Leu Val Ala Val Leu Leu
 1 5 10 15

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Ile Thr Val Gln Leu Val Val Arg Val Val Leu Ala Phe Gly Gly Tyr
20 25 30

Phe Tyr Trp Asp Asp Leu Ile Leu Val Gly Arg Ala Gly Thr Gly Gly
35 40 45

Leu Leu Ser Pro Ser Tyr Leu Phe Asp Asp His Asp Gly His Val Met
50 55 60

Pro Gly Ala Phe Leu Val Ala Gly Ala Ile Ile Arg Val Ala Pro Leu
65 70 75 80

Val Trp Thr Gly Pro Ala Ile Ser Leu Val Val Leu Gln Leu Leu Glu
85 90 95

Ser Leu Ala Leu Leu Arg Ala Leu Tyr Val Ile Ser Ser Trp Arg Pro
100 105 110

Val Leu Leu Ile Pro Leu Thr Phe Ala Leu Phe Thr Pro Leu Ala Val
115 120 125

Pro Gly Phe Ala Trp Trp Ala Ala Ala Leu Asn Ser Leu Pro Met Leu
130 135 140

Ala Ala Leu Ala Trp Val Cys Ala Asp Ala Ile Leu Leu Val Arg Thr
145 150 155 160

Gly Asn His Arg Tyr Ala Val Thr Gly Val Leu Val Tyr Leu Gly Gly
165 170 175

Leu Leu Phe Phe Glu Lys Ala Ala Val Ile Pro Phe Val Ser Phe Ala
180 185 190

Val Ala Ala Leu Gln Cys His Val Arg Gly Asp Arg Ser Ala Leu Ala
195 200 205

Thr Val Trp Arg Ala Gly Val Arg Leu Trp Thr Pro Ser Leu Ala Leu
210 215 220

Thr Val Gly Trp Val Ala Leu Tyr Leu Ala Val Val Asp Gln Arg Arg
225 230 235 240

Trp Ser Ser Asp Leu Ser Met Thr Trp Asp Leu Leu Cys Arg Ser Val

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245

250

255

Thr His Gly Ile Val Pro Ala Leu Ala Gly Gly Pro Trp Asp Trp Ala
 260 265 270

Arg Trp Ala Pro Ala Ser Pro Trp Ala Thr Pro Pro Ala Val Val Met
 275 280 285

Val Leu Gly Trp Leu Val Leu Ile Ala Val Leu Ala Leu Ser Leu Val
 290 295 300

Arg Lys Arg Arg Ile Gly Pro Val Trp Leu Thr Ala Ala Gly Tyr Ala
 305 310 315 320

Val Ala Cys Gln Val Pro Ile Phe Leu Met Arg Ser Ser Pro Phe Thr
 325 330 335

Ala Leu Glu Leu Ala Gln Thr Leu Arg Tyr Phe Pro Asp Leu Val Val
 340 345 350

Val Leu Ala Leu Leu Ala Ala Val Ala Leu Gln Ala Pro Asn Arg Ala
 355 360 365

Gly Thr Arg Trp Leu Asp Ala Ser Pro Ala Arg Ala Val Ala Thr Val
 370 375 380

Ala Ser Ala Val Leu Phe Leu Thr Ser Ser Leu Tyr Ser Thr Ala Thr
 385 390 395 400

Phe Leu Ala Ser Trp Arg Asp Asn Pro Thr Glu Gly Tyr Leu Lys Asn
 405 410 415

Ala Gln Ala Ser Leu Ala Ala Ala Ala Ser Gly Ala Pro Leu Leu Asp
 420 425 430

Gln Glu Val Asp Pro Leu Val Leu Gln Arg Val Ala Trp Pro Glu Asn
 435 440 445

Leu Ala Ser His Met Phe Ala Leu Leu Arg Val Arg Pro Glu Phe Ala
 450 455 460

Thr Thr Thr Thr Gln Leu Arg Met Phe Thr Ser Thr Gly Arg Leu Val
 465 470 475 480

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Asp Ala Lys Val Thr Trp Val Arg Thr Ile Ile Ala Gly Pro Val Pro
 485 490 495

Gln Cys Gly Tyr Phe Val Gln Pro Asp Arg Pro Glu Arg Leu Ile Leu
 500 505 510

Asp Gly Pro Leu Leu Pro Gly Asp Trp Thr Val Glu Leu Asn Tyr Leu
 515 520 525

Ala Asn Ser Asp Gly Ser Met Ala Leu Ala Leu Ser Asp Gly Pro Glu
 530 535 540

Arg Lys Val Pro Val His Pro Gly Leu Asn Arg Val Tyr Ala Arg Leu
 545 550 555 560

Pro Gly Ala Gly Asp Ala Ile Thr Val Arg Ala Asn Thr Thr Ala Leu
 565 570 575

Ser Leu Cys Ile Gly Ala Ala Pro Val Gly Phe Leu Ala Pro Ala
 580 585 590

<210> 184

<211> 1773

<212> DNA

<213> Mycobacterium tuberculosis

<400> 184

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gtcggcaggg ccggcactgg gggcctggtg tcgccgtcgt acctgttcga cgaccacgac      180
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ctgcgcgcgt tgtatgtgat atcgagctgg cggccggtac tcctgatccc attgacgttc      360
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gagaaggccg cggtgatccc gttcgtctcc ttgcgggtgg ccgcgctgca gtgccatgtg      600

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 ggagcggcgc cgggtgggatt tctggcaccg gcc 1773

<210> 185

<211> 498

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 185

Met Thr Glu Thr Val Thr Arg Thr Ala Ala Pro Ala Val Val Gly Lys
 1 5 10 15

Leu Ser Thr Leu Asp Arg Phe Leu Pro Val Trp Ile Gly Ser Ala Met

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	20							25									30
Ala	Ala	Gly	Leu	Leu	Leu	Gly	Arg	Trp	Ile	Pro	Gly	Leu	His	Thr	Ala		
		35					40					45					
Leu	Glu	Gly	Val	Gln	Leu	Asp	Gly	Ile	Ser	Leu	Pro	Ile	Ala	Leu	Gly		
	50					55					60						
Leu	Leu	Ile	Met	Met	Tyr	Pro	Val	Leu	Ala	Lys	Val	Arg	Tyr	Asp	Arg		
65					70					75					80		
Leu	Asp	Thr	Val	Thr	Gly	Asp	Arg	Lys	Leu	Leu	Leu	Ser	Ser	Leu	Leu		
				85					90					95			
Leu	Asn	Trp	Val	Leu	Gly	Pro	Ala	Leu	Met	Phe	Ala	Leu	Ala	Trp	Leu		
			100					105					110				
Leu	Leu	Ala	Asp	Leu	Pro	Glu	Tyr	Arg	Thr	Gly	Leu	Ile	Ile	Val	Gly		
		115					120					125					
Leu	Ala	Arg	Cys	Ile	Ala	Met	Val	Ile	Ile	Trp	Asn	Asp	Leu	Ala	Cys		
	130					135					140						
Gly	Asp	Arg	Glu	Ala	Ala	Ala	Val	Leu	Val	Ala	Leu	Asn	Ser	Ile	Phe		
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Gln	Val	Ala	Met	Phe	Ala	Ala	Leu	Gly	Trp	Phe	Tyr	Leu	Ser	Val	Leu		
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Pro	Gly	Trp	Leu	Gly	Leu	Glu	Gln	Thr	Thr	Ile	Ala	Thr	Ser	Pro	Trp		
			180					185					190				
Gln	Ile	Ala	Lys	Ser	Val	Leu	Ile	Phe	Leu	Gly	Ile	Pro	Leu	Leu	Ala		
		195					200					205					
Gly	Tyr	Leu	Ser	Arg	Arg	Ile	Gly	Glu	Lys	Thr	Lys	Gly	Arg	Asn	Trp		
	210					215					220						
Tyr	Glu	Ser	Arg	Phe	Leu	Pro	Lys	Val	Gly	Pro	Trp	Ala	Leu	Tyr	Gly		
225					230					235					240		
Leu	Leu	Phe	Thr	Ile	Val	Ile	Leu	Phe	Ala	Leu	Gln	Gly	Asp	Gln	Ile		
				245					250					255			

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Thr Gly Arg Pro Leu Asp Val Ala Arg Ile Ala Leu Pro Leu Leu Ala
 260 265 270

Tyr Phe Ala Ile Met Trp Val Gly Gly Tyr Leu Leu Gly Ala Ala Leu
 275 280 285

Arg Leu Gly Tyr Arg Arg Thr Thr Thr Leu Ala Phe Thr Ala Ala Ser
 290 295 300

Asn Asn Phe Glu Leu Ala Ile Ala Val Ala Ile Ala Thr Tyr Gly Ala
 305 310 315 320

Thr Ser Gly Gln Ala Leu Ala Gly Val Val Gly Pro Leu Ile Glu Val
 325 330 335

Pro Val Leu Val Gly Leu Val Tyr Val Ser Leu Ala Leu Arg Asn Arg
 340 345 350

Leu Ala Gly Pro Asn Ala Thr His Asp Ala Asp Lys Pro Ser Val Leu
 355 360 365

Phe Val Cys Val His Asn Ala Gly Arg Ser Gln Met Ala Ala Gly Leu
 370 375 380

Leu Thr His Leu Ala Gly Asp Arg Ile Glu Val Arg Ser Ala Gly Thr
 385 390 395 400

Glu Pro Ala Gly Gln Val Asn Pro Thr Ala Val Ala Ala Met Ala Glu
 405 410 415

Met Gly Ile Asp Ile Thr Ala Asn Ala Pro Thr Leu Leu Thr Gly Gly
 420 425 430

Gln Val Gln Ser Ser Asp Val Val Ile Thr Met Gly Cys Gly Asp Ala
 435 440 445

Cys Pro Tyr Phe Pro Gly Val Ser Tyr Arg Asn Trp Lys Leu Pro Asp
 450 455 460

Pro Ala Gly Gln Pro Leu Asp Val Val Arg Met Ile Arg Asp Asp Ile
 465 470 475 480

Ala Asp Arg Val Gln Ala Leu Ile Ala Glu Leu Leu Ala Thr Ala Lys
 485 490 495

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Thr Arg

<210> 186

<211> 1494

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 186

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tggattcccg gcctgcacac cgcoctagaa ggggttcagc tcgacgggat ttcgctgccg   180
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gccgccgggc tattgacca cttggccggg gaccgcatcg aagtcggttc ggcgggaacc  1200
gagcccgcg gtcagggtcaa tccgacggct gtggccgcga tggccgaaat gggcatcgat  1260

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atcacccgcca atgccccac attgctcacc ggcgggcagg tccagtccag cgacgtcgtc 1320
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 aaactacccg atccccgcgg ccagcccctc gacgttgtgc gcatgatccg cgacgacatc 1440
 gcagaccgcg tccaagccct gatcgccgag ctgctggcca ccgccaagac caga 1494

<210> 187

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 187

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
 20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 188

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

-230-

<400> 188
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 gtcgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccgt 120
 ctacttggtg ttggctgcgc ggagacgggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac cacgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 189

<211> 475

<212> PRT

<213> Mycobacterium tuberculosis

<400> 189

Met Ala Asp Ile Pro Tyr Gly Arg Asp Tyr Pro Asp Pro Ile Trp Cys
 1 5 10 15

Asp Glu Asp Gly Gln Pro Met Pro Pro Val Gly Ala Glu Leu Leu Asp
 20 25 30

Asp Ile Arg Ala Phe Leu Arg Arg Phe Val Val Tyr Pro Ser Asp His
 35 40 45

Glu Leu Ile Ala His Thr Leu Trp Ile Ala His Cys Trp Phe Met Glu
 50 55 60

Ala Trp Asp Ser Thr Pro Arg Ile Ala Phe Leu Ser Pro Glu Pro Gly
 65 70 75 80

Ser Gly Lys Ser Arg Ala Leu Glu Val Thr Glu Pro Leu Val Pro Arg
 85 90 95

Pro Val His Ala Ile Asn Cys Thr Pro Ala Tyr Leu Phe Arg Arg Val
 100 105 110

Ala Asp Pro Val Gly Arg Pro Thr Val Leu Tyr Asp Glu Cys Asp Thr
 115 120 125

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Leu Phe Gly Pro Lys Ala Lys Glu His Glu Glu Ile Arg Gly Val Ile
 130 135 140

Asn Ala Gly His Arg Lys Gly Ala Val Ala Gly Arg Cys Val Ile Arg
 145 150 155 160

Gly Lys Ile Val Glu Thr Glu Glu Leu Pro Ala Tyr Cys Ala Val Ala
 165 170 175

Leu Ala Gly Leu Asp Asp Leu Pro Asp Thr Ile Met Ser Arg Ser Ile
 180 185 190

Val Val Arg Met Arg Arg Arg Ala Pro Thr Glu Pro Val Glu Pro Trp
 195 200 205

Arg Pro Arg Val Asn Gly Pro Glu Ala Glu Lys Leu His Asp Arg Leu
 210 215 220

Ala Asn Trp Ala Ala Ala Ile Asn Pro Leu Glu Ser Gly Trp Pro Ala
 225 230 235 240

Met Pro Asp Gly Val Thr Asp Arg Arg Ala Asp Val Trp Glu Ser Leu
 245 250 255

Val Ala Val Ala Asp Thr Ala Gly Gly His Trp Pro Lys Thr Ala Arg
 260 265 270

Ala Thr Ala Glu Thr Asp Ala Thr Ala Asn Arg Gly Ala Lys Pro Ser
 275 280 285

Ile Gly Val Leu Leu Leu Arg Asp Ile Arg Arg Val Phe Ser Asp Arg
 290 295 300

Asp Arg Met Arg Thr Ser Asp Ile Leu Thr Gly Leu Asn Arg Met Glu
 305 310 315 320

Glu Gly Pro Trp Gly Ser Ile Arg Arg Gly Asp Pro Leu Asp Ala Arg
 325 330 335

Gly Leu Ala Thr Arg Leu Gly Arg Tyr Gly Ile Gly Pro Lys Phe Gln
 340 345 350

His Ser Gly Gly Glu Pro Pro Tyr Lys Gly Tyr Ser Arg Thr Gln Phe
 355 360 365

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Glu Asp Ala Trp Ser Arg Tyr Leu Ser Ala Asp Asp Glu Thr Pro Glu
 370 375 380

Glu Arg Asp Leu Ser Val Ser Ala Val Ser Ala Val Ser Pro Pro Val
 385 390 395 400

Gly Asp Pro Gly Asp Ala Thr Gly Ala Thr Asp Ala Thr Asp Leu Pro
 405 410 415

Glu Ala Gly Asp Leu Pro Tyr Glu Pro Pro Ala Pro Asn Gly His Pro
 420 425 430

Asn Gly Asp Ala Pro Leu Cys Ser Gly Pro Gly Cys Pro Asn Lys Leu
 435 440 445

Leu Ser Thr Glu Ala Lys Ala Ala Gly Lys Cys Arg Pro Cys Arg Gly
 450 455 460

Arg Ala Ala Ala Ser Ala Arg Asp Gly Ala Arg
 465 470 475

<210> 190

<211> 1425

<212> DNA

<213> Mycobacterium tuberculosis

<400> 190

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 ttcgtagtct atccaagcga ccatgaactg atcgcgacaca ccctctggat tgcgcattgc 180
 tggtttatgg aggcgtggga ctcaacgccc cgaatcgctt ttttgtcacc ggaacccggc 240
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 atcaactgca caccggccta cctgttccgt cgggtggccg atccggtcgg gcggccgacc 360
 gtccctgtacg acgagtgtga caccctgttt ggcccgaag ctaaagaaca cgaggaaatt 420
 cgcggcgtga tcaacgccgg ccaccgcaag ggagccgtcg cgggccgctg cgtcatccgc 480
 ggcaagatcg ttgagaccga ggaactgcca gcgtactgtg cggtcgcctt ggccggcctc 540

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gacgacctgc ccgacacccat catgtctcgg tcgatcgtgg tgaggatgcg caggagggca 600
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<210> 191

<211> 429

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 191

Val Ser Val Val Ala Val Thr Ile Phe Val Ala Ala Tyr Val Leu Ile
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Ala Ser Asp Arg Val Asn Lys Thr Met Val Ala Leu Thr Gly Ala Ala
 20 25 30

Ala Val Val Val Leu Pro Val Ile Thr Ser His Asp Ile Phe Tyr Ser
 35 40 45

His Asp Thr Gly Ile Asp Trp Asp Val Ile Phe Leu Leu Val Gly Met
 50 55 60

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Met Ile Ile Val Gly Val Leu Arg Gln Thr Gly Val Phe Glu Tyr Thr
65 70 75 80

Ala Ile Trp Ala Ala Lys Arg Ala Arg Gly Ser Pro Leu Arg Ile Met
85 90 95

Ile Leu Leu Val Leu Val Ser Ala Leu Ala Ser Ala Leu Leu Asp Asn
100 105 110

Val Thr Thr Val Leu Leu Ile Ala Pro Val Thr Leu Leu Val Cys Asp
115 120 125

Arg Leu Asn Ile Asn Thr Thr Ser Phe Leu Met Ala Glu Val Phe Ala
130 135 140

Ser Asn Ile Gly Gly Ala Ala Thr Leu Val Gly Asp Pro Pro Asn Ile
145 150 155 160

Ile Val Ala Ser Arg Ala Gly Leu Thr Phe Asn Asp Phe Met Leu His
165 170 175

Leu Thr Pro Leu Val Val Ile Val Leu Ile Ala Leu Ile Ala Val Leu
180 185 190

Pro Arg Leu Phe Gly Ser Ile Thr Val Glu Ala Asp Arg Ile Ala Asp
195 200 205

Val Met Ala Leu Asp Glu Gly Glu Ala Ile Arg Asp Arg Gly Leu Leu
210 215 220

Val Lys Cys Gly Ala Val Leu Val Leu Val Phe Ala Ala Phe Val Ala
225 230 235 240

His Pro Val Leu His Ile Gln Pro Ser Leu Val Ala Leu Leu Gly Ala
245 250 255

Gly Met Leu Ile Val Val Ser Gly Leu Thr Arg Ser Glu Tyr Leu Ser
260 265 270

Ser Val Glu Trp Asp Thr Leu Leu Phe Phe Ala Gly Leu Phe Ile Met
275 280 285

Val Gly Ala Leu Val Lys Thr Gly Val Val Asn Asp Leu Ala Arg Ala
290 295 300

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Ala Thr Gln Leu Thr Gly Gly Asn Ile Val Ala Thr Ala Phe Leu Ile
 305 310 315 320

Leu Gly Val Ser Ala Pro Ile Ser Gly Ile Ile Asp Asn Ile Pro Tyr
 325 330 335

Val Ala Thr Met Thr Pro Leu Val Ala Glu Leu Val Ala Val Met Gly
 340 345 350

Gly Gln Pro Ser Thr Asp Thr Pro Trp Trp Ala Leu Ala Leu Gly Ala
 355 360 365

Asp Phe Gly Gly Asn Leu Thr Ala Ile Gly Ala Ser Ala Asn Val Val
 370 375 380

Met Leu Gly Ile Ala Arg Arg Ala Gly Ala Pro Ile Ser Phe Trp Glu
 385 390 395 400

Phe Thr Arg Lys Gly Ala Val Val Thr Ala Val Ser Ile Ala Leu Ala
 405 410 415

Ala Ile Tyr Leu Trp Leu Arg Tyr Phe Val Leu Leu His
 420 425

<210> 192

<211> 1287

<212> DNA

<213> Mycobacterium tuberculosis

<400> 192

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 acatcccacg acatcttcta ttcccacgac accggaatcg actgggacgt cattttcttg 180
 ttggtgggca tgatgatcat cgtcggagtg ctgcggcaga cgggggtggt cgaatacacc 240
 gcgatctggg ccgccaagcg cgcccgcggc tcgccgctac gcacatgat cctgctggta 300
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 ccggtcacgc tattggtgtg cgaccggtta aacatcaaca cgacgtcggt cctgatggcc 420

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gaagtcttcg cctccaacat tggtagcgcc gcgacgttgg tgggtgaccc gccgaacatc 480
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 gtagtcattg tgctgatcgc cctcatcgct gtgctgcccc gcctgttcgg ctcgatcacg 600
 gtcgaagccg atcgaattgc cgatgtcatg gcgctcgacg aggggtgaagc catccgcgac 660
 cgcggactgc tgggtcaaata tggcgccgtg ctgggtgctgg tggtcgcggc cttcgtcgcc 720
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 gcgaacgtcg tcatgctcg aatcgcccg cgcgaggag ctcccatctc gttctgggag 1200
 ttcacccgca aaggggcggg ggtcacggc gtctcgatcg cgtcgcggc gatctacctg 1260
 tgggtgcggg acttcgtgtt gttgcac 1287

<210> 193

<211> 237

<212> PRT

<213> Mycobacterium tuberculosis

<400> 193

Met Thr Arg Leu Val Pro Ala Leu Arg Leu Glu Leu Thr Leu Gln Val
 1 5 10 15

Arg Gln Lys Phe Leu His Ala Ala Val Phe Ser Gly Leu Ile Trp Leu
 20 25 30

Ala Val Leu Leu Pro Met Pro Val Ser Leu Arg Pro Val Ala Glu Pro
 35 40 45

Tyr Val Leu Val Gly Asp Ile Ala Ile Ile Gly Phe Phe Phe Val Gly
 50 55 60

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Gly Thr Val Phe Phe Glu Lys Gln Glu Arg Thr Ile Gly Ala Ile Val
 65 70 75 80

Ser Thr Pro Leu Arg Phe Trp Glu Tyr Leu Ala Ala Lys Leu Thr Val
 85 90 95

Leu Leu Ala Ile Ser Leu Phe Val Ala Val Val Val Ala Thr Ile Val
 100 105 110

His Gly Leu Gly Tyr His Leu Leu Pro Leu Val Ala Gly Ile Val Leu
 115 120 125

Gly Thr Leu Leu Met Leu Leu Val Gly Phe Ser Ser Ser Leu Pro Phe
 130 135 140

Ala Ser Val Thr Asp Trp Phe Leu Ala Ala Val Ile Pro Leu Ala Ile
 145 150 155 160

Met Leu Ala Pro Pro Val Val His Tyr Ser Gly Leu Trp Pro Asn Pro
 165 170 175

Val Leu Tyr Leu Ile Pro Thr Gln Gly Pro Leu Leu Leu Gly Ala
 180 185 190

Ala Phe Asp Gln Val Ser Leu Ala Pro Trp Gln Val Gly Tyr Ala Val
 195 200 205

Val Tyr Pro Ile Val Cys Ala Ala Gly Leu Cys Arg Ala Ala Lys Ala
 210 215 220

Leu Phe Gly Arg Tyr Val Val Gln Arg Ser Gly Val Leu
 225 230 235

<210> 194

<211> 711

<212> DNA

<213> Mycobacterium tuberculosis

<400> 194

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agcctgcgcc cggtcgccga accctatgtc ctggtgggtg atatcgcat catcgggttc 180
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 tcgacgccgc tgcggttctg ggagtacctg gctgccaaac taactgtgct gctggcgatc 300
 tcgctgttcg ttgcggttgt cgtggccacc atcgttcacg ggcttgggta ccacctgctg 360
 ccgctgggtg ccggcatcgt gctgggcaca ctgctgatgc tgctggtcgg cttcagttcc 420
 tcgttgccgt tcgcctcggg gaccgattgg ttcttggcgg cggtcatccc gctcgcgatc 480
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 atccccaccc aggggcccgt gctcttgctc ggcgcgccgt tcgatcagg gagcttggcg 600
 ccctggcagg tcgggtatgc ggtggtctac ccaatcgtgt gtgcggcggg attgtgccgg 660
 gcggccaagg cgctattcgg ccgttatgtc gtgcaaagat cgggtgtgct g 711

<210> 195

<211> 657

<212> PRT

<213> Mycobacterium tuberculosis

<400> 195

Val Ser Lys Leu Ser Thr Ala Ala Arg Arg Leu Leu Ile Gly Arg Pro
 1 5 10 15

Phe Arg Ser Asp Arg Leu Ser His Thr Leu Leu Pro Lys Arg Ile Ala
 20 25 30

Leu Pro Val Phe Ala Ser Asp Ala Met Ser Ser Ile Ala Tyr Ala Pro
 35 40 45

Glu Glu Ile Phe Leu Val Leu Ser Val Ala Gly Leu Ala Ala Tyr Ser
 50 55 60

Met Ala Pro Leu Ile Gly Leu Ala Val Ala Ala Val Leu Leu Val Val
 65 70 75 80

Val Ser Ser Tyr Arg Gln Asn Val His Ala Tyr Pro Ser Gly Gly Gly
 85 90 95

Asp Tyr Glu Val Val Thr Thr Asn Leu Gly Ala Thr Gly Gly Leu Val

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100	105	110
Val Ala Ser Ala Leu Met Val Asp Tyr Val Leu Thr Val Ala Val Ser		
115	120	125
Ile Ser Ser Ala Ala Ser Asn Ile Gly Ser Val Ser Pro Phe Val Tyr		
130	135	140
Glu His Lys Val Leu Phe Ala Val Gly Ala Ile Val Leu Ile Met Ala		
145	150	155 160
Met Asn Leu Arg Gly Val Arg Glu Ser Gly Leu Ala Phe Ala Ile Pro		
165	170	175
Thr Tyr Ala Phe Ile Ala Gly Ile Gly Thr Met Leu Val Trp Gly Leu		
180	185	190
Phe Arg Ile Phe Val Leu Gly Asn Pro Val Arg Ala Glu Ser Ala Ala		
195	200	205
Phe Glu Met His Ala Glu His Gly Gln Ile Val Gly Phe Ala Leu Val		
210	215	220
Phe Leu Val Ala Arg Ser Phe Ser Ser Gly Cys Ala Ala Leu Thr Gly		
225	230	235 240
Val Glu Ala Ile Ser Asn Gly Val Pro Ala Phe Gln Lys Pro Lys Ser		
245	250	255
Arg Asn Ala Ala Thr Thr Leu Leu Met Leu Gly Ile Ile Ala Val Ser		
260	265	270
Met Phe Met Gly Met Ile Val Leu Ala Val Glu Thr Gly Val Gln Val		
275	280	285
Val Asp Asp Pro Asp Thr Gln Leu Thr Gly Ala Pro Pro Gly Tyr Gln		
290	295	300
Gln Lys Thr Leu Val Ala Gln Leu Ala Gln Ala Val Phe Gly Gly Phe		
305	310	315 320
Tyr Leu Gly Phe Leu Leu Ile Ala Ala Val Thr Ala Leu Ile Leu Val		
325	330	335

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Leu Ala Ala Asn Thr Ala Phe Asn Gly Phe Pro Val Leu Gly Ser Val
 340 345 350

Leu Ala Gln His Ser Tyr Leu Pro Arg Gln Leu His Thr Arg Gly Asp
 355 360 365

Arg Leu Ala Phe Ser Asn Gly Ile Leu Phe Leu Ala Ala Ala Ala Ile
 370 375 380

Gly Ala Val Val Ala Phe Arg Ala Glu Leu Thr Ala Leu Ile Gln Leu
 385 390 395 400

Tyr Ile Val Gly Val Phe Ile Ser Phe Thr Met Ser Gln Val Gly Met
 405 410 415

Val Arg His Trp Thr Arg Leu Leu Ser Ala Glu Thr Asp Pro Arg Ala
 420 425 430

Arg Arg Ala Met Leu Arg Ser Arg Ala Val Asn Thr Val Gly Phe Val
 435 440 445

Ser Thr Gly Thr Val Leu Leu Ile Val Leu Val Thr Lys Phe Leu Ala
 450 455 460

Gly Ala Trp Ile Ala Ile Val Ala Met Gly Gly Phe Phe Met Met Met
 465 470 475 480

Lys Leu Ile His Arg His Tyr Asp Ala Val Asn Arg Glu Leu Ala Glu
 485 490 495

Gln Ala Glu Glu Ala Glu Ile Thr Leu Pro Ser Arg Asn His Ala Val
 500 505 510

Val Leu Val Ser Lys Leu His Leu Pro Thr Leu Arg Ala Leu Thr Tyr
 515 520 525

Ala Arg Ala Thr Arg Pro Asp Val Leu Glu Ala Val Thr Val Asn Val
 530 535 540

Asp Asp Ala Glu Thr Arg Glu Leu Val Arg Gln Trp Gln Asp Ser Asp
 545 550 555 560

Val Ser Val Pro Leu Lys Val Ile Ala Ser Pro Tyr Arg Glu Ile Thr
 565 570 575

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Arg Pro Val Leu Asp Tyr Val Lys Arg Val Ser Lys Glu Ser Pro Arg
 580 585 590

Thr Val Val Thr Val Phe Ile Pro Glu Tyr Val Val Gly Arg Trp Trp
 595 600 605

Glu Gln Leu Leu His Asn Gln Ser Ala Leu Arg Leu Lys Gly Arg Leu
 610 615 620

Leu Phe Met Pro Gly Val Met Val Thr Ser Val Pro Trp Gln Leu Thr
 625 630 635 640

Ser Ser Glu Arg Ile Lys Thr Leu Gln Pro His Ala Ala Pro Gly Asp
 645 650 655

Thr

<210> 196

<211> 1971

<212> DNA

<213> Mycobacterium tuberculosis

<400> 196

gtgtccaaac tttcaaccgc ggcgcgtcgg ttgctgatcg gccggccgtt tcgcagtgc 60
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 atgtcgtcga tagcctacgc ccccaggag atatttctgg tgcctctcggg ggccggcctg 180
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<210> 197

<211> 549

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 197

Val Ser Thr Thr Ser Ala Arg Pro Glu Arg Pro Lys Leu Arg Ala Leu

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Thr Gly Arg Val Gly Gly Gln Ala Leu Gly Gly Leu Leu Gly Leu Pro	20	25	30
Arg Ala Thr Thr Arg Tyr Thr Val Gly His Val Arg Val Pro Met Arg	35	40	45
Asp Gly Val Gln Leu Val Ala Asp His Tyr Ala Pro Ala Thr Ser Gln	50	55	60
Pro Val Gly Thr Leu Leu Val Arg Gly Pro Tyr Gly Arg Arg Phe Pro	65	70	75
			80
Phe Ser Leu Val Phe Ala Arg Ile Tyr Ala Ala Arg Gly Tyr His Val	85	90	95
Val Leu Gln Ser Val Arg Gly Thr Phe Gly Ser Gly Gly Val Phe Glu	100	105	110
Pro Met Val Asn Glu Ala Ala Asp Gly Ala Asp Thr Val Ala Trp Leu	115	120	125
Arg Glu Gln Pro Trp Phe Thr Gly Arg Phe Gly Thr Ile Gly Leu Pro	130	135	140
Tyr Leu Gly Phe Thr Gln Trp Ala Leu Leu His Asp Pro Pro Pro Glu	145	150	155
			160
Leu Ala Ala Ala Val Ile Thr Val Gly Pro His Asp Phe Arg Ala Ser	165	170	175
Val Trp Gly Thr Gly Ser Phe Thr Val Asn Asp Phe Leu Gly Trp Ser	180	185	190
Asp Leu Val Ser His Gln Glu Asp Pro Gly Arg Ile Arg Ala Gly Ile	195	200	205
Arg Gln Leu Thr Ala Pro Arg Arg Val Ala Arg Thr Ala Ala Thr Leu	210	215	220
Pro Leu Gly Glu Ser Ala Arg Thr Leu Leu Gly Thr Gly Ala Pro Trp	225	230	235
			240

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Phe Glu Ser Trp Val Glu His Thr Asp Arg Asp Asp Pro Phe Trp Asp
245 250 255

Arg Leu Arg Phe Pro Ala Ala Leu Asp Arg Val Gln Val Pro Val Leu
260 265 270

Leu Val Gly Gly Trp Gln Asp Ile Phe Leu Arg Gln Thr Leu Gln Gln
275 280 285

Tyr Arg His Leu Arg Asp Arg Gly Val His Val Ala Leu Thr Val Gly
290 295 300

Pro	Trp	Thr	His	Thr	Gln	Met	Leu	Thr	Lys	Gly	Leu	Ala	Thr	Gly	Ala
305					310					315					320

Arg Glu Ser Leu Asp Trp Leu Asp Ala His Leu Gly Arg Ala Pro Ala
325 330 335

Leu Arg Pro Ser Pro Val Arg Val Phe Val Thr Gly Gln Gly Trp Arg
340 345 350

His Leu Pro Asp Trp Pro Pro Ala Thr Thr Glu Arg Ala Trp Tyr Leu
355 360 365

Gln Pro Gly Gly Arg Leu Gly Glu Ser Ala Pro Ala Ser Gly Thr Pro
370 375 380

Pro Ala Thr Phe Arg Tyr His Pro Ala Asp Pro Thr Pro Thr Thr Gly
385 390 395 400

Gly Pro Leu Leu Ser Ser Asn Gly Gly Tyr Arg Asp Asp Ser Arg Leu
405 410 415

Ala Thr Arg Ala Asp Val Leu Cys Phe Thr Gly Ala Pro Leu Thr His
420 425 430

Asp Leu Cys Val His Gly Asn Pro Val Val Glu Leu Val His Ser Ser
435 440 445

Asp Asn Pro Tyr Val Asp Val Phe Val Arg Val Ser Glu Val Asp Ala
450 455 460

Lys Gly Arg Ser Arg Asn Val Ser Asp Gly Tyr Arg Arg Leu Gly Asp
465 470 475 480

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Ala Pro Glu Leu Val Arg Val Glu Leu Asp Ala Ile Ala His Arg Phe
 485 490 495

Arg Ala Asp Ser Arg Ile Arg Val Leu Ile Ala Gly Ser Trp Phe Pro
 500 505 510

Arg Tyr Ala Arg Asn Leu Gly Thr Pro Glu Pro Ile Leu Thr Gly Arg
 515 520 525

Gln Leu Lys Pro Ala Thr His Ala Val His Phe Gly Arg Ser Arg Leu
 530 535 540

Leu Leu Pro Val Gly
 545

<210> 198

<211> 1647

<212> DNA

<213> Mycobacterium tuberculosis

<400> 198
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 ggtcacgtcc gagtcccgat gcgcgacggc gtccagctgg tggccgacca ctacgcaccc 180
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 gccgccacgt tgccgctggg tgagtcggcc cggacgctgc tcggcacggg tgcgccgtgg 720
 ttcgaatcct gggtggaaca caccgaccgc gacgatccgt tctgggaccg actgcggttt 780

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ccgcgcgcgt tggaccgcgt ccaggtcccg gtgctgctcg tcggcggctg gcaggacatc      840
ttcctgcggc agacgctgca gcagtaccgg cacctgcgcg accgggggtgt gcacgtcgcg      900
ctgacggctg gtccctggac acacaccag atgctcacca aggggctggc caccggcgct      960
cgggaatcgt tggactgggt ggacgccac ctcggcgggg cgcgggcgt gcgcccagc     1020
ccggtgcggg tcttcgtcac cggccagggc tggcggcacc tgccggactg gcctccggcg     1080
accaccgagc gggcgtggta cctgcagccc ggtggccgcc tgggtgagag cgctccggct     1140
tccggcacgc caccggcgac gtttcgtac caccgcgcg acccgacacc gaccaccggt     1200
ggtccgctac tgtcatcaa cggcggttac cgcgacgaca gccggctggc cgcgcgcgc     1260
gatgtgctgt gcttcaccgg ggcgcccctc acccacgacc tctgcgtgca cggaacccc     1320
gtcgtcgagc tgggtgcacag ctcgacaac ccctacgtcg acgtgttcgt tcgggtcagc     1380
gaggtggacg cgaagggccg gtcccgcaat gtcagcgacg gctaccggcg ccttgggtgac     1440
gcgcgggagc tgggtccgct cgagctggac gccatcgccc accgattccg cgcgactcc     1500
cgcatccggg tgctgatecg cggtagttgg tttcccgcgt atgcgcgaaa cctcggcacc     1560
ccggaaccga tactcaccgg acggcagctc aagccggcta cccacgcggt gcatttcggg     1620
cgctcccggc tgctgctgcc cgtcggc                                     1647

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<210> 199

<211> 469

<212> PRT

<213> Mycobacterium tuberculosis

<400> 199

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Val Ala Val Gly Asp Asp Glu Glu Lys Val Arg Ala Glu Arg Ala Arg
1           5           10          15

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Ala Ile Gly Leu Phe Arg Tyr Gln Leu Ile Trp Glu Ala Ala Asp Ala
          20           25           30

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Ala His Ser Thr Lys Gln Arg Gly Lys Met Val Arg Glu Leu Ala Ser
          35           40           45

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Arg Glu His Thr Asp Pro Phe Gly Arg Arg Val Arg Ile Ser Arg Gln
          50           55           60

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Thr Ile Asp Arg Trp Ile Arg Gly Trp Arg Ala Gly Gly Phe Asp Ala
 65 70 75 80

Leu Val Pro Asn Pro Arg Gln Cys Thr Pro Arg Thr Pro Ala Glu Val
 85 90 95

Leu Glu Leu Ala Val Ala Leu Arg Arg Glu Asn Pro Gln Arg Thr Ala
 100 105 110

Ala Ala Ile Arg Arg Ile Leu Arg Thr Gln Leu Gly Trp Ala Pro Asp
 115 120 125

Glu Arg Thr Leu Gln Arg Asn Phe His Arg Leu Gly Leu Thr Gly Ala
 130 135 140

Thr Thr Gly Ser Ala Pro Ala Val Phe Gly Arg Phe Glu Ala Glu His
 145 150 155 160

Pro Asn Ala Leu Trp Thr Gly Asp Val Leu His Gly Ile Arg Ile Asp
 165 170 175

Leu Arg Lys Thr Tyr Leu Phe Ala Phe Leu Asp Asp His Ser Arg Leu
 180 185 190

Val Pro Gly Tyr Arg Trp Gly His Ala Glu Asp Thr Val Arg Leu Ala
 195 200 205

Ala Ala Leu Arg Pro Ala Leu Ala Ser Arg Gly Val Pro Asn Ala Val
 210 215 220

Tyr Val Asp Asn Gly Ser Pro Tyr Val Asp Ala Trp Leu Leu Arg Ala
 225 230 235 240

Cys Ala Lys Leu Gly Val Arg Leu Val His Ser Thr Pro Gly Arg Pro
 245 250 255

Gln Gly Arg Gly Lys Ile Glu Arg Phe Phe Arg Thr Val Arg Glu Gln
 260 265 270

Phe Leu Val Glu Ile Thr Gly Glu Pro Asp Val Val Gly Arg His Tyr
 275 280 285

Val Ala Asp Leu Ala Glu Leu Asn Arg Leu Phe Thr Ala Trp Val Glu
 290 295 300

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Thr Val Tyr His Arg Ser Val His Ser Glu Thr Gly Gln Thr Pro Leu
 305 310 315 320

Ala Arg Trp Ser Ala Gly Gly Pro Ile Pro Leu Pro Ala Pro Glu Thr
 325 330 335

Leu Thr Glu Ala Phe Leu Trp Glu Glu His Arg Arg Val Thr Lys Thr
 340 345 350

Ala Thr Val Ser Leu His Gly Asn Arg Tyr Glu Ile Asp Pro Ala Leu
 355 360 365

Val Gly Arg Lys Val Glu Leu Val Phe Asp Pro Phe Asp Leu Thr Arg
 370 375 380

Ile Glu Val Arg Leu Ala Gly Ala Pro Met Arg Arg Ala Ile Pro Tyr
 385 390 395 400

His Ile Gly Arg His Ser His Pro Lys Ala Lys Pro Glu Thr Pro Thr
 405 410 415

Ala Pro Pro Lys Pro Ser Gly Ile Asp Tyr Ala Gln Leu Ile Glu Thr
 420 425 430

Ala His Ala Ala Glu Leu Ala Arg Gly Val Asn Tyr Thr Ala Leu Thr
 435 440 445

Gly Ala Ala Asp Gln Ile Pro Gly Gln Leu Asp Leu Leu Thr Gly Gln
 450 455 460

Glu Ala Gln Pro Lys
 465

<210> 200

<211> 1407

<212> DNA

<213> Mycobacterium tuberculosis

<400> 200

gtggcggtcg gcgatgacga ggagaagggtg cgcgcgggagc gcgcgagggc gatcggggtg

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```

tttcgctacc agttgatttg ggaggccgcc gatgcggcgc attccaccaa gcagcgggga      120
aagatggtgc gcgagttggc ctcacgcgag cacaccgatc cgttcgggcg gcgggtgcgc      180
atcagccgcc aaaccatcga ccgctggatc cggggctggc gggccggcgg gttcgacgcg      240
ctggtgcccc acccacgcca gtgcacaccg cgtaccccg ccgaggtgct ggagctggcg      300
gtggcgctgc ggcgggaaaa cccgcagcgc acggcggcgg caatccggcg gatcctgcgt      360
accagttgg gctgggcgcc cgatgaacgc accctgcaac gcaacttcca ccggctcggg      420
ctcaccggcg ccaccaccgg gtcggcgccg gcggtgttcg gccggttcga agccgagcac      480
ccgaacgccc tgtggaccgg ggatgtgttg cacggcatac ggattgatct ccgcaagacc      540
tatctgttcg cgttcttaga cgaccattcc cggttggtgc ccggctaccg gtggggccat      600
gccgaggaca cggtgccggt ggccgccgca ctgcgcccgg cgctggcctc ccgcggcgtg      660
cccaacgcgg tgtatgtcga taacggctcg ccctatgtgg atgcgtggtt gttgcgggca      720
tgcgcgaaac tcggtgtgcg ccttgttcat tccacgccag gtcggccgca aggcaggggc      780
aagatagaga ggttcttcg caccgtgcgc gagcagttcc tggtcgagat caccggcgaa      840
ccgacgtcg tcggccgaca ttacgtcgct gatctggccg agttgaatcg gctgtttacg      900
gcctgggtcg aaacggttta tcaccgcagc gtgcattccg aaaccgggca gaccccgctg      960
gcccgtggt cagccggcgg ccccatcccg ctgcccgcc ccgagacgct caccgaggcc      1020
ttcctgtggg aggagcaccg ccgcgtgacc aagaccgcca ccgtctcgt gcacggcaac      1080
cgctacgaga tcgaccggc gctggtcggc cggaagtgg agttggtgtt cgaccggttc      1140
gatttgacce gcatcgaggt gcggctggcc ggcgcgccga tgaggcgggc cattccgtat      1200
cacatcgggc gccattcaca cccgaaagcc aaaccggaaa cccccaccgc accgccccaa      1260
cccagcggca tcgactacgc gcagttaatc gagaccgcgc acgcagccga actcggccgc      1320
ggcgtcaact acaccgccct caccgggggt gccgatcaga tccccggcca gtcgacctg      1380
ctcaccggcc aggaggccca accgaaa
                                                                 1407

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<210> 201

<211> 270

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 201

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Met Met His Lys Leu Ile Ser Tyr Tyr Gly Phe Ser Arg Met Pro Phe
 1 5 10 15

Gly Arg Asp Leu Ala Pro Gly Met Leu His Arg His Ser Ala His Asn
 20 25 30

Glu Ala Val Ala Arg Ile Gly Trp Cys Ile Ala Asp Arg Arg Ile Gly
 35 40 45

Val Ile Thr Gly Glu Val Gly Ala Gly Lys Thr Val Ala Val Arg Ala
 50 55 60

Ala Leu Ala Ser Leu Asp Arg Ser Arg His Thr Ile Ile Tyr Leu Pro
 65 70 75 80

Asp Pro Thr Val Gly Val Gln Gly Ile His His Arg Ile Val Ala Ser
 85 90 95

Leu Gly Gly Gln Pro Leu Thr His His Ala Thr Leu Ala Pro Gln Ala
 100 105 110

Ala Asp Ala Leu Ala Ala Glu Gln Ala Glu Arg Gly Arg Thr Pro Val
 115 120 125

Val Val Val Glu Glu Ala His Leu Leu Gly Tyr Asp Gln Leu Glu Ala
 130 135 140

Leu Arg Leu Leu Thr Asn His Asp Leu Asp Ser Ser Ser Pro Phe Ala
 145 150 155 160

Cys Leu Leu Ile Gly Gln Pro Thr Leu Arg Arg Arg Met Lys Leu Gly
 165 170 175

Val Leu Ala Ala Leu Asp Gln Arg Ile Gly Leu Arg Tyr Ala Met Pro
 180 185 190

Pro Met Thr Asp Thr Asn Thr Gly Ser Tyr Leu Arg His His Leu Lys
 195 200 205

Leu Ala Gly Arg Asp Asp Ala Leu Phe Ser Asp Asp Ala Ile Gly Leu
 210 215 220

Ile His Gln Thr Ser Arg Gly Tyr Pro Arg Ala Val Asn Asn Leu Ala
 225 230 235 240

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<400> 203

Met Ala Ala Pro Gln Arg Ala Arg Leu Arg Ser Ser Lys Glu Arg Val
 1 5 10 15

Arg Asp Tyr Ala Leu Phe Val Val Leu Val Gly Pro Asn Val Ala Leu
 20 25 30

Leu Leu Leu Phe Val Tyr Arg Pro Leu Ala Asp Asn Ile Arg Leu Ser
 35 40 45

Phe Phe Asp Trp Asn Val Ser Asp Pro Ser Ala Arg Phe Val Gly Leu
 50 55 60

Ser Asn Tyr Thr Glu Trp Phe Thr Arg Ser Asp Thr Arg Gln Ile Val
 65 70 75 80

Phe Asn Thr Ala Val Phe Thr Gly Ala Ala Val Val Gly Ser Met Val
 85 90 95

Leu Gly Leu Ala Leu Ala Met Leu Leu Asp Arg Pro Leu Arg Gly Arg
 100 105 110

Asn Leu Val Arg Ser Thr Val Phe Ala Pro Phe Val Ile Ser Gly Ala
 115 120 125

Ala Val Gly Leu Ala Ala Gln Phe Val Phe Asp Pro His Phe Gly Leu
 130 135 140

Ile Gln Asp Leu Leu Arg Arg Ile Gly Val Gly Val Pro Asp Phe Tyr
 145 150 155 160

Gln Asp Ala Arg Trp Ala Leu Phe Met Val Thr Ile Thr Tyr Val Trp
 165 170 175

Lys Asn Leu Gly Tyr Thr Phe Val Ile Tyr Leu Ala Ala Leu Gln Gly
 180 185 190

Val Arg Arg Asp Leu Leu Glu Ala Ala Glu Ile Asp Gly Ala Ser Arg
 195 200 205

Trp Ala Val Phe Arg Arg Val Leu Leu Pro Gln Leu Arg Pro Thr Thr
 210 215 220

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Phe Phe Leu Ser Ile Thr Val Leu Ile Asn Ser Leu Gln Val Phe Asp
 225 230 235 240

Val Ile Asn Val Met Thr Arg Gly Gly Pro Glu Gly Thr Gly Thr Thr
 245 250 255

Thr Met Val Tyr Gln Val Tyr Val Glu Thr Phe Arg Asn Phe Arg Ala
 260 265 270

Gly Tyr Gly Ala Thr Val Ala Thr Ile Met Phe Leu Val Leu Leu Ala
 275 280 285

Val Thr Tyr Tyr Gln Val Arg Val Met Asp Arg Gly Gln Arg Gln
 290 295 300

<210> 204

<211> 909

<212> DNA

<213> Mycobacterium tuberculosis

<400> 204

atggcgggcg cgcaacgagc acggcttcgg tcatcgaaag agcgcgtgcg cgattatgcg 60
 ctgttcgctg tgttggtcgg cccaatgtg gcgctattgc tgctgttcgt ctatcgcccc 120
 ttggccgaca acatccgggt gtggttcttc gactggaacg tctccgatcc gtcggccccg 180
 tttgtggggt tatccaacta caccgagtgg ttcacccggg cggacacccg ccagatcggt 240
 ttcaacacgg cggttttcac cggtgccgcg gtggctcggt cgatgggtgct ggggttgggc 300
 ctggcgatgc tgctcgatcg accgttgctg ggacgaaacc tggcgcgctc cactgttttc 360
 gcgcggttcg tgatctccgg tgccgctgtc ggcctggccg ccagtttcgt ctccgacccg 420
 catttcggtc tgattcaaga cctgttgctc cggatcgggg tgggggtgcc cgacttttac 480
 caggatgcgc gctgggctgt gttcatggtg accatcacct acgtctggaa gaacctcggc 540
 tataccttcg tgatctatct ggccgcttg cagggggtac gccgagatct gttggaggcg 600
 gccgaaatcg acggcgccag ccggtgggcc gtgttccgtc gaggctggt gccgcagctg 660
 cggccgacca cgtttttctt gtcgatcacc gtgctgatca actcgctgca ggtgttcgat 720
 gtgatcaacg tgatgacctg gggcgggccc gagggcaccg gcaccaccac catggtgtac 780
 cagggtgatg tggagacgtt ccgcaatttc cgggcccgtt atggcgccac ggtggccacg 840

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atcatgttcc tgggtgctgct ggccgtgacg tactaccagg tgcgggtgat ggatcggggg 900
cagcggcag 909

<210> 205

<211> 695

<212> PRT

<213> Mycobacterium tuberculosis

<400> 205

Met Val Glu Ser Arg Arg Ala Ala Ala Ala Ala Ser Ala Tyr Ala Ser
1 5 10 15

Arg Cys Gly Ile Ala Pro Ala Thr Ser Gln Arg Ser Leu Ala Thr Pro
20 25 30

Pro Thr Ile Ser Val Pro Ser Gly Glu Gly Arg Cys Arg Cys His Val
35 40 45

Ala Arg Gly Ala Gly Arg Asp Pro Arg Arg Arg Leu Arg Arg Arg Arg
50 55 60

Trp Cys Gly Arg Cys Gly Tyr His Ser His Leu Thr Gly Gly Glu Phe
65 70 75 80

Asp Val Asn Arg Leu Cys Gln Gln Arg Ser Arg Glu Arg Ser Cys Gln
85 90 95

Leu Val Ala Val Pro Ala Asp Pro Arg Pro Lys Arg Gln Arg Ile Thr
100 105 110

Asp Val Leu Thr Leu Ala Leu Val Gly Phe Leu Gly Gly Leu Ile Thr
115 120 125

Gly Ile Ser Pro Cys Ile Leu Pro Val Leu Pro Val Ile Phe Phe Ser
130 135 140

Gly Ala Gln Ser Val Asp Ala Ala Gln Val Ala Lys Pro Glu Gly Ala
145 150 155 160

Val Ala Val Arg Arg Lys Arg Ala Leu Ser Ala Thr Leu Arg Pro Tyr

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165	170	175
Arg Val Ile Gly Gly Leu Val Leu Ser Phe Gly Met Val Thr Leu Leu		
180	185	190
Gly Ser Ala Leu Leu Ser Val Leu His Leu Pro Gln Asp Ala Ile Arg		
195	200	205
Trp Ala Ala Leu Val Ala Leu Val Ala Ile Gly Ala Gly Leu Ile Phe		
210	215	220
Pro Arg Phe Glu Gln Leu Leu Glu Lys Pro Phe Ser Arg Ile Pro Gln		
225	230	240
Lys Gln Ile Val Thr Arg Ser Asn Gly Phe Gly Leu Gly Leu Ala Leu		
245	250	255
Gly Val Leu Tyr Val Pro Cys Ala Gly Pro Ile Leu Ala Ala Ile Val		
260	265	270
Val Ala Gly Ala Thr Ala Thr Ile Gly Leu Gly Thr Val Val Leu Thr		
275	280	285
Ala Thr Phe Ala Leu Gly Ala Ala Leu Pro Leu Leu Phe Phe Ala Leu		
290	295	300
Ala Gly Gln Arg Ile Ala Glu Arg Val Gly Ala Phe Arg Arg Arg Gln		
305	310	315
Arg Glu Ile Arg Ile Ala Thr Gly Ser Val Thr Ile Leu Leu Ala Val		
325	330	335
Ala Leu Val Phe Asp Leu Pro Ala Ala Leu Gln Arg Ala Ile Pro Asp		
340	345	350
Tyr Thr Ala Ser Leu Gln Gln Gln Ile Ser Thr Gly Thr Glu Ile Arg		
355	360	365
Glu Gln Leu Asn Leu Gly Gly Ile Val Asn Ala Gln Asn Ala Gln Leu		
370	375	380
Ser Asn Cys Ser Asp Gly Ala Ala Gln Leu Glu Ser Cys Gly Thr Ala		
385	390	395
		400

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Pro Asp Leu Lys Gly Ile Thr Gly Trp Leu Asn Thr Pro Gly Asn Lys
 405 410 415

Pro Ile Asp Leu Lys Ser Leu Arg Gly Lys Val Val Leu Ile Asp Phe
 420 425 430

Trp Ala Tyr Ser Cys Ile Asn Cys Gln Arg Ala Ile Pro His Val Val
 435 440 445

Gly Trp Tyr Gln Ala Tyr Lys Asp Ser Gly Leu Ala Val Ile Gly Val
 450 455 460

His Thr Pro Glu Tyr Ala Phe Glu Lys Val Pro Gly Asn Val Ala Lys
 465 470 475 480

Gly Ala Ala Asn Leu Gly Ile Ser Tyr Pro Ile Ala Leu Asp Asn Asn
 485 490 495

Tyr Ala Thr Trp Thr Asn Tyr Arg Asn Arg Tyr Trp Pro Ala Glu Tyr
 500 505 510

Leu Ile Asp Ala Thr Gly Thr Val Arg His Ile Lys Phe Gly Glu Gly
 515 520 525

Asp Tyr Asn Val Thr Glu Thr Leu Val Arg Gln Leu Leu Asn Asp Ala
 530 535 540

Lys Pro Gly Val Lys Leu Pro Gln Pro Ser Ser Thr Thr Thr Pro Asp
 545 550 555 560

Leu Thr Pro Arg Ala Ala Leu Thr Pro Glu Thr Tyr Phe Gly Val Gly
 565 570 575

Lys Val Val Asn Tyr Gly Gly Gly Gly Ala Tyr Asp Glu Gly Ser Ala
 580 585 590

Val Phe Asp Tyr Pro Pro Ser Leu Ala Ala Asn Ser Phe Ala Leu Arg
 595 600 605

Gly Arg Trp Ala Leu Asp Tyr Gln Gly Ala Thr Ser Asp Gly Asn Asp
 610 615 620

Ala Ala Ile Lys Leu Asn Tyr His Ala Lys Asp Val Tyr Ile Val Val
 625 630 635 640

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Gly Gly Thr Gly Thr Leu Thr Val Val Arg Asp Gly Lys Pro Ala Thr
 645 650 655

Leu Pro Ile Ser Gly Pro Pro Thr Thr His Gln Val Val Ala Gly Tyr
 660 665 670

Arg Leu Ala Ser Glu Thr Leu Glu Val Arg Pro Ser Lys Gly Leu Gln
 675 680 685

Val Phe Ser Phe Thr Tyr Gly
 690 695

<210> 206

<211> 2085

<212> DNA

<213> Mycobacterium tuberculosis

<400> 206

atggttgagt cgagacgagc tgctgcggcg gcttcggcat acgcaagcag atgcgggatt	60
gcacccgcga cctcgcaacg ctactggcg acaccaccga cgatctcggg cccgtccggg	120
gagggccgct gccgttgcca cgtcgcaagg ggtgccggtc gtgaccacg acggcgactt	180
cgacgccgtc gatggtgtgg ccgatgtggc tatcattcgc atctgacggg tggcgagttc	240
gacgtgaacc gactctgtca acagcgctcg cgtgagcggg cctgccaaact cgttgccgtc	300
ccggcagatc caagacctaa acggcaacga ataaccgatg tgttgaccct cgactagtc	360
ggcttcctcg gcggcctcat caccggaata tcaccatgca ttctgccggg cctgccagta	420
atcttcttct ccggcgcgca gagcgctgat gcagcgcagg tggcgaaacc cgaaggcgcc	480
gtagcagtcg ggcgcaaacg tgcgctatca gcgacattgc ggccctaccg ggtgatcggg	540
ggtctggtgc tcagtttcgg catggtcacc ctgctcggct cggcattgct gtcagtgtg	600
catctaccgc aggacgcat ccgctgggcc gcaactggcg ccttggtggc aatcggcgcc	660
ggcctcattt tcccgcgggt tgaacaactt ctggaaaaac cgttctcccg tattccgcag	720
aagcaaatacg tcaactcgag caacggtttc gggctgggtc tagccctggg cgtgttgat	780
gtcccctgcg ccggcccgat tctagctgcg atcgtcgtgg ccggggctac tgccaccatc	840
gggttgggaa ccgtcgtgct caccgcgaca ttcgcactcg gagecgcgtt gccgttggtg	900

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ttcttcgccc tcgccggcca acggatagct gagcgggtgg gcgcttttcg gcgccgccag      960
cgtgagatca ggatcgccac cggttccgtg acgatcctgc tggcgggtggc gttggtgttc      1020
gatctgccgg ccgcgctgca gcgggctatt cctgactaca ccgcatcgct gcagcagcag      1080
atcagcaccg gcacggagat acgggaacaa ctgaaccttg gcggcatcgt caacgcccag      1140
aacgcacagc tgtcgaattg cagcgacggg gccgcacaac tcgaaagctg cggcactgca      1200
ccagatctca aaggcatcac cggctggctc aacacgcccg gcaacaagcc gatcgacctg      1260
aaatcattgc gtggcaaggc ggtgctgatt gacttttggg cctactcctg cattaactgc      1320
caacggggcca tccccacgt cgtcggttgg tatcaggcct acaaagacag tggtttgccg      1380
gtcatcggcg tgcacacccc cgagtacgct ttcgagaagg tcccgggcaa cgtcgccaaa      1440
ggcgcggcca atctgggcat cagctatccg attgcgctcg acaacaacta cgccacttgg      1500
accaactacc ggaatcgcta ttggcccgcc gagtatctga tcgacgctac cgggacgggtg      1560
cggcacatca agttcggaga aggcgattac aacgtcaccg agacgttggc caggcagttg      1620
ctcaacgatg ccaagcccgg cgtcaaactc cccagccca gcagcaccac cagccccgac      1680
cttaccocgc gggccgcact tactcccgag acgtacttcg gagtcggcaa ggtggtcaac      1740
tacggcggcg gcggcgcata tgacgaaggg tcggccgtgt ttgactaccg gccagtttg      1800
gcagccaaca gctttgcact gcgcggccgg tgggcgctgg actatcaggg tgccacgtcc      1860
gacggcaacg acgccgtat caaattgaat taccacgcca aagacgtcta catcgttgtc      1920
ggtggcaccg gcaccctcac ggtcgtgagg gacggaaagc cagccacact accgatcagc      1980
gggcgcccga ccacccatca ggtggtcgcc ggetatcggc tggcgtccga aacacttgag      2040
gtgcggccca gcaaggggct acagggtttt tccttcacct acgga                        2085

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<210> 207

<211> 287

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 207

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Val Asn Glu Ala Leu Ile Gly Leu Ala Phe Ala Ala Gly Leu Val Ala
1           5           10          15

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Ala Leu Asn Pro Cys Gly Phe Ala Met Leu Pro Ala Tyr Leu Leu Leu

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20	25	30
Val Val Tyr Gly Gln Asp Ser Ala Gly Arg Thr Gly Pro Leu Ser Ala		
35	40	45
Val Gly Arg Ala Ala Ala Ala Thr Val Gly Met Ala Leu Gly Phe Leu		
50	55	60
Thr Val Phe Gly Ile Phe Gly Ala Leu Thr Ile Ser Ala Ala Thr Ala		
65	70	75 80
Val Gln Arg Tyr Leu Pro Tyr Ala Thr Val Leu Ile Gly Leu Ala Leu		
85	90	95
Ile Ala Leu Gly Gly Trp Leu Leu Leu Gly Arg Gly Leu Thr Ala Leu		
100	105	110
Thr Pro Arg Ser Leu Gly Val Arg Trp Ala Pro Thr Val Arg Leu Gly		
115	120	125
Ser Met Tyr Gly Tyr Gly Ile Ser Tyr Ala Val Ala Ser Leu Ser Cys		
130	135	140
Thr Ile Gly Pro Phe Leu Ala Val Thr Gly Ala Gly Leu Arg Gly Gly		
145	150	155 160
Ser Val Val Gly Ser Val Ala Ile Tyr Leu Ala Tyr Val Ala Gly Leu		
165	170	175
Thr Leu Val Val Gly Val Leu Ala Val Ala Ala Ala Thr Ala Ser Ser		
180	185	190
Ala Leu Ala Asp Arg Leu Arg Arg Ile Leu Pro Phe Val Asn Arg Ile		
195	200	205
Ser Gly Ala Leu Leu Val Val Val Gly Leu Tyr Val Gly Tyr Tyr Gly		
210	215	220
Leu Tyr Glu Leu Arg Leu Ile Ala Gly Val Gly Ala Asn Pro Gln Asp		
225	230	235 240
Ala Val Ile Ala Ala Ala Gly Arg Leu Gln Gly Ala Leu Ala Gly Trp		
245	250	255

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Val Asn Gln His Gly Ala Trp Pro Trp Ala Val Leu Leu Val Val Leu
 260 265 270

Val Val Gly Ala Phe Ala Gly Thr Trp Phe Arg Arg Val Arg Arg
 275 280 285

<210> 208

<211> 861

<212> DNA

<213> Mycobacterium tuberculosis

<400> 208

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gtgaacgagg cgctgatcgg ttggcggttc gccgccgggt tggaggctgc gctgaaccca      60
tgccgggtttg ccatgttgcc ggccctacctg ctgttggtgg tgtatgggca ggattcggcg      120
ggccggacgg ggccgcttag cgcagtgggc cgagcggcag ccgccacggg cgggatggcg      180
ctgggcttct tgacgggtgt cggcatcttc ggagccctga ccatttcgcg ggccacggcg      240
gtgcagcgat acctgcccta tgccacgggt ctgatcggtc tggcgctcat cgccctcggc      300
gggtggctgc tgttgggacg agggctgacg gcgttgacgc cccgatccct cggcgtgcgt      360
tgggctccaa cggtagcggt gggttccatg tatggctacg gcatcagcta tgcggttgct      420
tcgctgtcat gcaccatcgg gccgtttctc gcggttaccg gggcaggcct gcggggcggt      480
tcggtcgtcg ggagcgtagc gatctatctg gcttatgtcg cgggcctgac ctcggtgtc      540
ggcgtgcttg ccgtcgcggc cgcgaccgag agctcggcgc tggccgaccg cctacggcga      600
atcttgccgt tcgtcaaccg gatcagtggc gcgctgctgg tggaggctcg gctgtacgtg      660
ggttactacg gtctctacga gctgcgcctg attgccgggt tcggggcgaa tccccaggat      720
gcggtgattg ccgcggccgg ccgcctgcaa ggtgccctgg ctggctgggt taaccagcac      780
ggtgcatggc cttgggcggg gttgctggtt gtgctggtgg tcggtgcctt cgccgggtacc      840
tggtttcggc gggcgcggcg c

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<210> 209

<211> 413

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 209

Met Leu Thr Val Glu Asp Trp Ala Glu Ile Arg Arg Leu His Arg Ala
 1 5 10 15

Glu Gly Leu Pro Ile Lys Met Ile Ala Arg Val Leu Gly Ile Ser Lys
 20 25 30

Asn Thr Val Lys Ser Ala Leu Glu Ser Asn Gln Gln Pro Lys Tyr Glu
 35 40 45

Arg Ala Pro Gln Gly Ser Ile Val Asp Ala Val Glu Pro Arg Ile Arg
 50 55 60

Glu Leu Leu Gln Ala Tyr Pro Thr Met Pro Ala Thr Val Ile Ala Glu
 65 70 75 80

Arg Ile Gly Trp Glu Arg Ser Ile Arg Val Leu Ser Ala Arg Val Ala
 85 90 95

Glu Leu Arg Pro Val Tyr Leu Pro Pro Asp Pro Ala Ser Arg Thr Thr
 100 105 110

Tyr Val Ala Gly Glu Ile Ala Gln Cys Asp Phe Trp Phe Pro Pro Ile
 115 120 125

Glu Leu Pro Val Gly Phe Gly Gln Thr Arg Thr Ala Lys Gln Leu Pro
 130 135 140

Val Leu Thr Met Val Cys Ala Tyr Ser Arg Trp Leu Leu Ala Met Leu
 145 150 155 160

Leu Pro Ser Arg Cys Ala Glu Asp Leu Phe Ala Gly Trp Trp Arg Leu
 165 170 175

Ile Glu Ala Leu Gly Ala Val Pro Arg Val Leu Val Trp Asp Gly Glu
 180 185 190

Gly Ala Ile Gly Arg Trp Arg Gly Gly Arg Ser Glu Leu Thr Thr Glu
 195 200 205

Cys Gln Ala Phe Arg Gly Thr Leu Ala Ala Lys Val Leu Ile Cys Arg
 210 215 220

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Pro Ala Asp Pro Glu Ala Lys Gly Leu Ile Glu Arg Ala His Asp Tyr
 225 230 235 240

Leu Glu Arg Ser Phe Leu Pro Gly Arg Val Phe Ala Ser Pro Ala Asp
 245 250 255

Phe Asn Ala Gln Leu Gly Ala Trp Leu Ala Leu Val Asn Thr Arg Thr
 260 265 270

Arg Arg Ala Leu Gly Cys Ala Pro Thr Asp Arg Ile Gly Ala Asp Arg
 275 280 285

Ala Ala Met Leu Ser Leu Pro Pro Val Ala Pro Ala Thr Gly Trp Cys
 290 295 300

Thr Ser Leu Arg Leu Pro Arg Asp His Tyr Val Arg Cys Asp Ser Asn
 305 310 315 320

Asp Tyr Ser Val His Pro Gly Val Ile Gly His Arg Val Leu Val Arg
 325 330 335

Ala Asp Leu Glu Arg Val His Val Phe Cys Asp Gly Glu Leu Val Ala
 340 345 350

Asp His Glu Arg Ile Trp Ala Val His Gln Thr Val Ser Asp Pro Ala
 355 360 365

His Val Glu Ala Ala Lys Val Leu Arg Arg Arg His Phe Ser Ala Ala
 370 375 380

Ser Pro Val Val Glu Pro Gln Val Gln Val Arg Ser Leu Ser Asp Tyr
 385 390 395 400

Asp Asp Ala Leu Gly Val Asp Ile Asp Gly Gly Val Ala
 405 410

<210> 210

<211> 1239

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 210
 atgttgactg tggaagattg ggctgagatt cgccgattgc atcgcgcgga gggtttgccg 60
 atcaagatga tcgcccgggt gctggggatt tccaagaaca cggatgaagtc agcgttgga 120
 tcaaaccagc agccgaaata tgaacgggca cgcaggggtt cgatcggtga tgcggttgag 180
 ccgcggatcc gggagttggt gcaggcctat ccgacgatgc cggcgacggg gatcgccgag 240
 cggatcgggt gggagcgctc gattcgggtg ctctcggcgc gggtgggcca gctgcgcccc 300
 gtgtatctgc cgccggaccc ggcgtcgcgc accacgtatg tggcaggcga aattgcccag 360
 tgcgacttct ggtttccgcc gatcgagttg ccggtagggg tcgggcagac ccgcacggcc 420
 aaacagttgc cgggtgctgac catggtgtgc gcctattcgc gctggctggt ggcgatgctg 480
 ctgcccagca ggtgtgccga ggacctgttc gccggctggg ggcggctgat cgaggcggtg 540
 ggggcgggtgc cgcgggtggt ggtgtgggat ggcgagggcg cgatcgggcg ctggcgcggc 600
 gggcggtcgg agttgaccac tgagtgtcag gcgttcgcgc gcacgctggc ggccaagggtg 660
 ctcatctgcc ggccggccga cccggaggcc aagggcctca ttgaacgggc ccacgactac 720
 ctggagcgct cgtttttgcc cgggcgggtg tttgcctcgc cggccgattt caacgccc 780
 ctgggcgcct ggctggcgct ggtgaacacc cgcacccgcc gggcgctggg ttgtgcgccc 840
 accgatcgca tcggcgcgga tcgggccgcg atgctgagct tgccgcccgt ggcgcccggc 900
 accgggtggt gcacctcgct gcggctgccc cgggatcact atgtgcgctg cgattccaac 960
 gactactcgg tgcaccggg tgtgatcggg catcgggtgc tggcgcgcg cgacctggag 1020
 cgggtgcatg tgttctgcga cggtagctg gtcgccgacc acgagcggat ctgggcggtc 1080
 catcagacgg tctccgatcc cgcacatgtg gaggcggcga aggtgttgcg ccgccggcac 1140
 ttcagtgcag catcaccggg agttgagccg cagggtgcagg tccgctcact gagcgactac 1200
 gatgacgcgc tgggagtcga catcgatggc ggggtggcc 1239

<210> 211

<211> 153

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 211

Val Asp Val Ile Trp Ser Ala Thr Ile Ala Thr Thr Val Ala Thr Gly
 1 5 10 15

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Met Arg Lys Pro Arg Met His Gly Met Pro Pro Ile Thr Ser Gly Ser
 20 25 30

Met Val Thr Arg Val Thr Arg Met Ser Ile Arg Leu Ala Gly Asp Ser
 35 40 45

Thr Leu Gly Arg Phe Ser Thr Ser Arg Leu Gly Leu Ser Ser Ala Lys
 50 55 60

Ser Lys Pro Glu Gly Asp Phe Gly Thr Ala Cys Gly Ala Val Ser Gly
 65 70 75 80

Gly Asp Ala Gly Val Val Ala Leu Ala Glu Gly Val Asp Asp Gly Gln
 85 90 95

Ser Lys Pro Gly Ala Ala Gly Gly Ala Arg Gly Val Gly Gly Phe Arg
 100 105 110

Glu Ser Arg Ala Asp Cys Gly Glu Gln Phe Gly Val Ala Ser Trp Thr
 115 120 125

Pro Gln Gly Glu Phe Glu Phe Gly Gly Gln Glu Ala Lys Gly Val Arg
 130 135 140

Ser Ser Trp Pro Ala Ser Leu Thr Asn
 145 150

<210> 212

<211> 459

<212> DNA

<213> Mycobacterium tuberculosis

<400> 212
 gtggatgtca tttggtccgc gaccatcgcg accacagtcg cactgggat gcgcaagccc 60
 cggatgcatg gcatgcctcc catcacgtcg gggtcgatgg tgacgcgggt gactcgcatg 120
 tctataaggc tagccggtga cagcacgtcg gggcggttct ccaccagccg tcttggtta 180
 agctcagcca agagcaagcc ggagggagat ttgggcaccg cctgcggcgc ggtttcgggc 240
 ggtgacgtcg gcgtggttgc gttggctgag ggtgtgacg atggccagtc caagcccgg 300

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gccgcggtg gtgcgcgcgg tgtcgggtgt ttccgcgaga gccgagcgga ttgcggcgag 360
 cagttcgggg ttgcttcgtg gacgccgcag ggcgagttcg agttcgggtg tcaggaggct 420
 aagggggtgc gaagttcgtg gcccgcatcg ctgacgaat 459

<210> 213

<211> 337

<212> PRT

<213> Mycobacterium tuberculosis

<400> 213

Val Ser Val Phe Ala Thr Ala Thr Gly Ile Gly Ser Trp Pro Gly Thr
 1 5 10 15

Ala Ala Arg Glu Ala Ala Gln Val Val Val Gly Glu Leu Ala Gly Ala
 20 25 30

Leu Ala Tyr Leu Thr Glu Leu Pro Ala Arg Gly Val Gly Ala Asp Met
 35 40 45

Leu Gly Arg Ala Gly Gly Leu Leu Val Asp Val Ala Ile Asp Thr Val
 50 55 60

Pro Arg Gly Tyr Arg Ile Ala Ala Arg Pro Gly Ala Val Thr Arg Arg
 65 70 75 80

Ala Ala Ser Leu Leu Asp Glu Asp Met Asp Ala Leu Glu Glu Ala Trp
 85 90 95

Glu Thr Ala Gly Leu Arg Gly Cys Gly Arg Ala Val Lys Val Gln Ala
 100 105 110

Pro Gly Pro Val Thr Leu Val Ala Gly Leu Glu Leu Ala Asn Gly His
 115 120 125

Arg Ala Ile Thr Asp Pro Gly Ala Val Arg Asp Leu Ala Ala Ser Leu
 130 135 140

Ala Glu Gly Val Ala Ala His Arg Ala Ala Leu Ala Arg Arg Leu Asp
 145 150 155 160

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Thr	Pro	Val	Val	Val	Gln	Phe	Asp	Glu	Pro	Ser	Leu	Pro	Ala	Ala	Leu
				165					170					175	

Gly Gly Arg Leu Thr Gly Val Thr Ala Leu Ser Pro Val Ala Pro Leu
180 185 190

Asp Glu Thr Val Ala Glu Ala Leu Leu Asp Thr Cys Ile Ala Ala Val
195 200 205

Asp Ala Asp Val Ala Leu His Ser Cys Ser Pro Asp Leu Pro Trp Asp
210 215 220

Leu Leu Gln Arg Ser Arg Ile Ser Ala Val Ser Val Asp Ala Ser Thr
225 230 235 240

Leu Gln Ala Ala Asp Leu Asp Ala Val Ala Ala Phe Val Glu Ser Gly
245 250 255

Arg Thr Val Val Leu Gly Leu Val Pro Val Thr Ala Pro Glu Arg Ala
260 265 270

Pro Ser Met Glu Glu Val Ala Ala Ala Ala Val Ala Val Thr Asp Arg
275 280 285

Leu Gly Val Pro Arg Ser Ala Leu Arg Asp Arg Leu Gly Val Ser Pro
290 295 300

Ala Cys Gly Leu Ala Asn Ala Thr Gly Gln Trp Ala Arg Thr Ala Val
305 310 315 320

Gly Leu Ala Arg Asp Val Ala Glu Ala Phe Ala Arg Asp Pro Glu Ala
325 330 335

Ile

<210> 214

<211> 1011

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 214

Gly Thr Gly Ala Gly Thr Gly Thr Thr Thr Thr Cys Gly Cys Ala Ala
 1 5 10 15
 Cys Gly Gly Cys Cys Ala Cys Cys Gly Gly Gly Ala Thr Cys Gly Gly
 20 25 30
 Ala Thr Cys Gly Thr Gly Gly Cys Cys Gly Gly Gly Cys Ala Cys Cys
 35 40 45
 Gly Cys Cys Gly Cys Gly Cys Gly Ala Gly Ala Gly Gly Cys Cys Gly
 50 55 60
 Cys Gly Cys Ala Gly Gly Thr Cys Gly Thr Gly Gly Thr Cys Gly Gly
 65 70 75 80
 Gly Gly Ala Gly Thr Thr Gly Gly Cys Gly Gly Gly Thr Gly Cys Ala
 85 90 95
 Thr Thr Gly Gly Cys Cys Thr Ala Thr Cys Thr Cys Ala Cys Cys Gly
 100 105 110
 Ala Gly Cys Thr Gly Cys Cys Cys Gly Cys Cys Ala Gly Gly Gly Gly
 115 120 125
 Cys Gly Thr Cys Gly Gly Cys Gly Cys Cys Gly Ala Cys Ala Thr Gly
 130 135 140
 Cys Thr Gly Gly Gly Gly Cys Gly Ala Gly Cys Cys Gly Gly Cys Gly
 145 150 155 160
 Gly Ala Cys Thr Gly Cys Thr Gly Gly Thr Cys Gly Ala Cys Gly Thr
 165 170 175
 Gly Gly Cys Gly Ala Thr Thr Gly Ala Cys Ala Cys Cys Gly Thr Gly
 180 185 190
 Cys Cys Thr Cys Gly Thr Gly Gly Cys Thr Ala Cys Cys Gly Cys Ala
 195 200 205
 Thr Cys Gly Cys Thr Gly Cys Thr Cys Gly Ala Cys Cys Cys Gly Gly
 210 215 220

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Cys Gly Cys Gly Gly Thr Gly Ala Cys Ala Cys Gly Gly Cys Gly Gly
 225 230 235 240

Gly Cys Cys Gly Cys Gly Ala Gly Cys Cys Thr Cys Cys Thr Cys Gly
 245 250 255

Ala Cys Gly Ala Gly Gly Ala Thr Ala Thr Gly Gly Ala Thr Gly Cys
 260 265 270

Cys Thr Thr Ala Gly Ala Ala Gly Ala Gly Gly Cys Cys Thr Gly Gly
 275 280 285

Gly Ala Gly Ala Cys Cys Gly Cys Gly Gly Gly Cys Cys Thr Gly Cys
 290 295 300

Gly Thr Gly Gly Cys Thr Gly Thr Gly Gly Gly Cys Gly Gly Gly Cys
 305 310 315 320

Gly Gly Thr Gly Ala Ala Gly Gly Thr Gly Cys Ala Gly Gly Cys Gly
 325 330 335

Cys Cys Cys Gly Gly Gly Cys Cys Ala Gly Thr Cys Ala Cys Ala Thr
 340 345 350

Thr Gly Gly Thr Cys Gly Cys Gly Gly Gly Gly Thr Thr Gly Gly Ala
 355 360 365

Gly Cys Thr Gly Gly Cys Cys Ala Ala Cys Gly Gly Thr Cys Ala Cys
 370 375 380

Cys Gly Gly Gly Cys Gly Ala Thr Cys Ala Cys Cys Gly Ala Cys Cys
 385 390 395 400

Cys Cys Gly Gly Ala Gly Cys Cys Gly Thr Gly Cys Gly Thr Gly Ala
 405 410 415

Cys Cys Thr Gly Gly Cys Cys Gly Cys Cys Thr Cys Gly Cys Thr Gly
 420 425 430

Gly Cys Cys Gly Ala Ala Gly Gly Cys Gly Thr Thr Gly Cys Cys Gly
 435 440 445

Cys Gly Cys Ala Thr Cys Gly Cys Gly Cys Gly Gly Cys Gly Cys Thr
 450 455 460

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Gly Gly Cys Gly Cys Gly Thr Cys Gly Ala Cys Thr Thr Gly Ala Cys
 465 470 475 480

Ala Cys Ala Cys Cys Gly Gly Thr Gly Gly Thr Gly Gly Thr Gly Cys
 485 490 495

Ala Gly Thr Thr Cys Gly Ala Cys Gly Ala Gly Cys Cys Gly Thr Cys
 500 505 510

Gly Thr Thr Gly Cys Cys Gly Gly Cys Gly Gly Cys Gly Thr Thr Gly
 515 520 525

Gly Gly Cys Gly Gly Cys Cys Gly Gly Cys Thr Gly Ala Cys Cys Gly
 530 535 540

Gly Gly Gly Thr Gly Ala Cys Cys Gly Cys Gly Thr Thr Gly Ala Gly
 545 550 555 560

Cys Cys Cys Gly Gly Thr Thr Gly Cys Cys Cys Cys Gly Cys Thr Cys
 565 570 575

Gly Ala Cys Gly Ala Gly Ala Cys Gly Gly Thr Gly Gly Cys Cys Gly
 580 585 590

Ala Ala Gly Cys Gly Cys Thr Gly Cys Thr Cys Gly Ala Cys Ala Cys
 595 600 605

Thr Thr Gly Cys Ala Thr Cys Gly Cys Gly Gly Cys Thr Gly Thr Cys
 610 615 620

Gly Ala Cys Gly Cys Gly Gly Ala Cys Gly Thr Ala Gly Cys Gly Cys
 625 630 635 640

Thr Ala Cys Ala Cys Ala Gly Cys Thr Gly Cys Ala Gly Thr Cys Cys
 645 650 655

Gly Gly Ala Thr Thr Thr Gly Cys Cys Gly Thr Gly Gly Gly Ala Thr
 660 665 670

Cys Thr Gly Cys Thr Gly Cys Ala Gly Cys Gly Cys Ala Gly Cys Ala
 675 680 685

Gly Ala Ala Thr Thr Ala Gly Thr Gly Cys Gly Gly Thr Ala Thr Cys

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690	695	700
Gly Gly Thr Gly Gly Ala Thr Gly Cys Gly Ala Gly Cys Ala Cys Ala		
705	710	715 720
Cys Thr Gly Cys Ala Gly Gly Cys Thr Gly Cys Gly Gly Ala Thr Thr		
	725	730 735
Thr Gly Gly Ala Thr Gly Cys Thr Gly Thr Cys Gly Cys Gly Gly Cys		
	740	745 750
Ala Thr Thr Thr Gly Thr Cys Gly Ala Gly Thr Cys Gly Gly Gly Cys		
	755	760 765
Cys Gly Ala Ala Cys Cys Gly Thr Cys Gly Thr Gly Cys Thr Gly Gly		
	770	775 780
Gly Cys Cys Thr Gly Gly Thr Cys Cys Cys Gly Gly Thr Gly Ala Cys		
	785	790 795 800
Cys Gly Cys Cys Cys Cys Gly Gly Ala Gly Cys Gly Ala Gly Cys Ala		
	805	810 815
Cys Cys Thr Thr Cys Gly Ala Thr Gly Gly Ala Ala Gly Ala Gly Gly		
	820	825 830
Thr Cys Gly Cys Thr Gly Cys Thr Gly Cys Gly Gly Cys Gly Gly Thr		
	835	840 845
Cys Gly Cys Gly Gly Thr Cys Ala Cys Cys Gly Ala Thr Cys Gly Gly		
	850	855 860
Cys Thr Cys Gly Gly Cys Gly Thr Thr Cys Cys Thr Cys Gly Cys Thr		
	865	870 875 880
Cys Gly Gly Cys Gly Cys Thr Ala Cys Gly Cys Gly Ala Thr Cys Gly		
	885	890 895
Ala Cys Thr Cys Gly Gly Cys Gly Thr Cys Ala Gly Cys Cys Cys Gly		
	900	905 910
Gly Cys Gly Thr Gly Thr Gly Gly Thr Cys Thr Gly Gly Cys Cys Ala		
	915	920 925

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Ala Thr Gly Cys Gly Ala Cys Gly Gly Gly Gly Cys Ala Gly Thr Gly
 930 935 940

Gly Gly Cys Cys Cys Gly Cys Ala Cys Cys Gly Cys Gly Gly Thr Cys
 945 950 955 960

Gly Gly Gly Cys Thr Thr Gly Cys Cys Cys Gly Thr Gly Ala Thr Gly
 965 970 975

Thr Cys Gly Cys Thr Gly Ala Gly Gly Cys Gly Thr Thr Cys Gly Cys
 980 985 990

Gly Cys Gly Gly Gly Ala Cys Cys Cys Ala Gly Ala Gly Gly Cys Cys
 995 1000 1005

Ala Thr Cys
 1010

<210> 215

<211> 81

<212> PRT

<213> Mycobacterium tuberculosis

<400> 215

Val Thr Ala Pro Val Trp Leu Ala Ser Pro Pro Glu Val His Ser Ala
 1 5 10 15

Leu Leu Ser Ala Gly Pro Gly Pro Gly Ser Leu Gln Ala Ala Ala Ala
 20 25 30

Gly Trp Ser Ala Leu Ser Ala Glu Tyr Ala Ala Val Ala Gln Glu Leu
 35 40 45

Ser Val Val Val Ala Ala Val Gly Ala Gly Val Trp Gln Gly Pro Ser
 50 55 60

Ala Glu Leu Phe Val Ala Ala Tyr Val Pro Tyr Val Ala Trp Leu Val
 65 70 75 80

Gln

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<210> 216

<211> 243

<212> DNA

<213> Mycobacterium tuberculosis

<400> 216

```

gtgacggcgc cgggtgtggtt ggcgtcgccg ccggagggtgc attcggcgct gctaagtgct      60
gggtccggggc cgggttcggtt gcaggcggcc gcggcgggggt ggagcgcggtt aagcgccgag      120
tacgccgctg tggcgcaaga gttgagcgtg gtggtggccg cgggtgggggc cgggggtgtgg      180
caggggtccca gtgctgagtt gtttgtggcc gcctatgtgc cgtatgtggc gtggttggtg      240
cag                                                                                   243

```

<210> 217

<211> 254

<212> PRT

<213> Mycobacterium tuberculosis

<400> 217

```

Val Pro Glu Phe Val Asn Val Val Val Ser Asp Gly Ser Gln Asp Ala
1           5           10           15

Gly Leu Ala Met Leu Leu Leu Ser Arg Pro Pro Thr Asn Ala Met Thr
                20           25           30

Arg Gln Val Tyr Arg Glu Val Val Ala Ala Ala Asn Glu Leu Gly Arg
          35           40           45

Arg Asp Asp Val Ala Ala Val Ile Leu Tyr Gly Gly His Glu Ile Phe
          50           55           60

Ser Ala Gly Asp Asp Met Pro Glu Leu Arg Thr Leu Ser Ala Gln Glu
65           70           75           80

Ala Asp Thr Ala Ala Arg Ile Arg Gln Gln Ala Val Asp Ala Val Ala
          85           90           95

```

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Ala Ile Pro Lys Pro Thr Val Ala Ala Ile Thr Gly Tyr Ala Leu Gly
 100 105 110

Ala Gly Leu Thr Leu Ala Leu Ala Ala Asp Trp Arg Val Ser Gly Asp
 115 120 125

Asn Val Lys Phe Gly Ala Thr Glu Ile Leu Ala Gly Leu Ile Pro Ser
 130 135 140

Gly Asp Gly Met Ala Arg Leu Thr Arg Ala Ala Gly Pro Ser Arg Ala
 145 150 155 160

Lys Glu Leu Val Phe Ser Gly Arg Phe Phe Asp Ala Glu Glu Ala Leu
 165 170 175

Ala Leu Gly Leu Ile Asp Asp Met Val Ala Pro Asp Asp Val Tyr Asp
 180 185 190

Ala Ala Ala Ala Trp Ala Arg Arg Phe Leu Asp Gly Pro Pro His Ala
 195 200 205

Leu Ala Ala Ala Lys Ala Gly Ile Ser Asp Val Tyr Glu Leu Ala Pro
 210 215 220

Ala Glu Arg Ile Ala Ala Glu Arg Arg Arg Tyr Val Glu Val Phe Ala
 225 230 235 240

Ala Gly Gln Gly Gly Gly Ser Lys Gly Asp Arg Gly Gly Arg
 245 250

<210> 218

<211> 762

<212> DNA

<213> Mycobacterium tuberculosis

<400> 218

gtgcccagat tcgtcaacgt cgtgggtcagt gacggctccc aggatgccgg cctggccatg 60
 ttgtcctat cgcgaccgcc taccaacgcg atgaccgcc aggtctaccg ggaagtggtc 120
 gccgcggcca acgagctggg gcgacgcgac gacgtggccg cagtgatcct gtatggcggc 180
 cacgaaatct tctccgcccg cgacgacatg cccgaactgc ggacattgag cgcgcaggag 240

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```

gccgacaccg ccgcccggat tcggcagcag gccgtcgacg ccgttgcggc gatccccaag    300
ccgaccgtgg ccgccatcac cggatacgcg ttgggtgccg gccttacgct ggccctagcc    360
gccgattggc gagtcagcgg tgacaacgtg aaattcggcg cgaccgagat cctggccggc    420
ctgatcccca gcggcgacgg aatggcccgg ctgaccctgt cggccgggtcc gagcagagcc    480
aaggagctgg tgttcagcgg gcgcttcttc gacgccgagg aggccttggc gctgggcctg    540
atcgacgaca tgggtggcccc cgacgacgtt tacgacgccg cggcggcctg ggcgaggcgc    600
tttcttgacg gcccgccgca cgcgctggcc gcggccaaag ccgggatcag cgacgtctac    660
gagctggcgc cggccgagcg gatcgccgct gagcgtcggc gctatgtcga ggtgttcgcc    720
gctgggtcaag gtggtggcag caagggtgac cggggcggcc gt                                762

```

<210> 219

<211> 721

<212> PRT

<213> Mycobacterium tuberculosis

<400> 219

```

Met Gly Ile Ala Leu Thr Asp Asp His Arg Glu Leu Ser Gly Val Ala
1           5           10          15

```

```

Arg Ala Phe Leu Thr Ser Gln Lys Val Arg Trp Ala Ala Arg Ala Ser
          20           25           30

```

```

Leu Asp Ala Ala Gly Asp Ala Arg Pro Pro Phe Trp Gln Asn Leu Ala
          35           40           45

```

```

Glu Leu Gly Trp Leu Gly Leu His Ile Asp Glu Arg His Gly Gly Ser
          50           55           60

```

```

Gly Tyr Gly Leu Ser Glu Leu Val Val Val Ile Glu Glu Leu Gly Arg
          65           70           75           80

```

```

Ala Val Ala Pro Gly Leu Phe Val Pro Thr Val Ile Ala Ser Ala Val
          85           90           95

```

```

Val Ala Lys Glu Gly Thr Asp Asp Gln Arg Ala Arg Leu Leu Pro Ala
          100          105          110

```

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Leu Ile Asp Gly Thr Leu Thr Ala Gly Val Gly Leu Asp Ser Gln Val
 115 120 125

Gln Val Thr Asp Gly Val Ala Asp Gly Glu Ala Gly Ile Val Leu Gly
 130 135 140

Ala Gly Leu Ala Glu Leu Leu Leu Val Ala Ala Gly Asp Asp Val Leu
 145 150 155 160

Val Leu Glu Arg Gly Arg Lys Gly Val Ser Val Asp Val Pro Glu Asn
 165 170 175

Phe Asp Pro Thr Arg Arg Ser Gly Arg Val Arg Leu Asp Asn Val Arg
 180 185 190

Val Thr Thr Asp Asp Ile Leu Leu Gly Ala Tyr Glu Ser Ala Leu Ala
 195 200 205

Arg Ala Arg Thr Leu Leu Ala Ala Glu Ala Val Gly Gly Ala Ala Asp
 210 215 220

Cys Val Asp Ser Ala Val Ala Tyr Ala Lys Val Arg Gln Gln Phe Gly
 225 230 235 240

Arg Thr Ile Ala Thr Phe Gln Ala Val Lys His His Cys Ala Asn Met
 245 250 255

Leu Val Ala Ala Glu Ser Ala Ile Ala Ala Val Trp Asp Ala Ala Arg
 260 265 270

Ala Ala Ala Glu Asp Glu Glu Gln Phe Arg Leu Ala Ala Ala Val Ala
 275 280 285

Ala Ala Leu Ala Phe Pro Ala Tyr Ala Arg Asn Ala Glu Leu Asn Ile
 290 295 300

Gln Val His Gly Gly Ile Gly Phe Thr Trp Glu His Asp Ala His Leu
 305 310 315 320

His Leu Arg Arg Ala Leu Val Thr Val Gly Leu Phe Gly Gly Asp Ala
 325 330 335

Pro Val Arg Asp Val Phe Glu Arg Thr Ala Ala Gly Val Thr Arg Ala
 340 345 350

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Ile Ser Leu Asp Leu Pro Ala Gln Ala Glu Glu Leu Arg Ala Arg Ile
 355 360 365

Arg Ser Asp Ala Ala Glu Ile Ala Ala Leu Glu Lys Asp Ala Gln Arg
 370 375 380

Asp Lys Leu Ile Glu Thr Gly Tyr Val Met Pro His Trp Pro Arg Pro
 385 390 395 400

Trp Gly Arg Ala Ala Gly Ala Val Glu Gln Leu Val Ile Glu Glu Glu
 405 410 415

Phe Ser Ala Ala Gly Ile Glu Arg Pro Asp Tyr Ser Ile Thr Gly Trp
 420 425 430

Val Ile Leu Thr Leu Ile Gln His Gly Thr Pro Trp Gln Ile Glu Arg
 435 440 445

Phe Val Glu Lys Ala Leu Arg Gln Gln Glu Ile Trp Cys Gln Leu Phe
 450 455 460

Ser Glu Pro Asp Ala Gly Ser Asp Ala Ala Ser Val Lys Thr Arg Ala
 465 470 475 480

Thr Arg Val Glu Gly Gly Trp Lys Ile Asn Gly Gln Lys Val Trp Thr
 485 490 495

Ser Gly Ala Gln Tyr Cys Ala Arg Gly Leu Ala Thr Val Arg Thr Asp
 500 505 510

Pro Asp Ala Pro Lys His Ala Gly Ile Thr Thr Val Ile Ile Asp Met
 515 520 525

Leu Ala Pro Gly Val Glu Val Arg Pro Leu Arg Gln Ile Thr Gly Asp
 530 535 540

Ser Glu Phe Asn Glu Val Phe Phe Asn Asp Val Phe Val Pro Asp Glu
 545 550 555 560

Asp Val Val Gly Ala Pro Asn Ser Gly Trp Thr Val Ala Arg Ala Thr
 565 570 575

Leu Gly Asn Glu Arg Val Ser Ile Gly Gly Ser Gly Ser Tyr Tyr Glu

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580

585

590

Ala Met Ala Ala Lys Leu Val Gln Leu Val Gln Arg Arg Ser Asp Ala
 595 600 605

Phe Ala Gly Ala Pro Ile Arg Val Gly Ala Phe Leu Ala Glu Asp His
 610 615 620

Ala Leu Arg Leu Leu Asn Leu Arg Arg Ala Ala Arg Ser Val Glu Gly
 625 630 635 640

Ala Gly Pro Gly Pro Glu Gly Asn Ile Thr Lys Leu Lys Val Ala Glu
 645 650 655

His Met Ile Glu Gly Ala Ala Ile Ala Ala Ala Leu Trp Gly Pro Glu
 660 665 670

Ile Ala Leu Leu Asp Gly Pro Gly Arg Val Ile Gly Arg Thr Val Met
 675 680 685

Gly Ala Arg Gly Met Ala Ile Ala Gly Gly Thr Ser Glu Val Thr Arg
 690 695 700

Asn Gln Ile Ala Glu Arg Ile Leu Gly Met Pro Arg Asp Pro Leu Ile
 705 710 715 720

Ser

<210> 220

<211> 2163

<212> DNA

<213> Mycobacterium tuberculosis

<400> 220

atgggtattg cattgaccga cgaccatcgc gagctctccg ggggtggctcg cgcgttcttg 60
 acttcgcaga aggtgcgctg ggcggcgcgt gcatcactgg acgcggcggg ggacgcccgc 120
 ccgccgttct ggcagaacct cgccgagctg ggctggctcg gcctgcatat cgacgagcga 180
 cacgggtggct ctggctatgg cctgtccgag cttgtggtgg tgatcgaaga gctcggctcg 240

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gcggtggcac	eggggctggt	tgtgccgacc	gtgatcgct	cagcgggtggt	cgccaaagaa	300
ggtactgatg	accaacgggc	acggctgttg	ccggcgctga	ttgacggaac	cctgacggcg	360
ggtgtgggac	tggatagtca	ggtgcagggt	accgacgggtg	ttgccgacgg	tgaggcgggg	420
atcgtgttg	gcgccgggct	tgccgagctg	ctgttggttg	ccgccgggtga	cgacgtgctg	480
gtgttggaac	gcggccgcaa	gggcgtctcg	gttgatgtgc	cggaaaactt	tgatccgacc	540
cggcggagtg	gccgcgtgcg	cctggacaac	gtgcgcgtca	cgaccgacga	catcctgctt	600
ggtgcgtatg	aatcggcttt	ggcccgcgcg	cgcacattgc	tggccgccga	ggccgtcgggt	660
ggggcgggcg	actgcgtgga	cagcgccgtg	gcctatgcc	aggtgcgaca	gcaattcggc	720
cgtaccatcg	ccacgtttca	agcgggtgaag	catcactgcg	cgaacatgct	ggtggccgcc	780
gagtcggcga	tcgcccggggt	ctgggatgcc	gcgcgtgcgg	cagcagagga	tgaggagcag	840
tttcggctgg	ccgcccggggt	cgctgcggcc	ctggcgtttc	cggcctatgc	acgcaatgcc	900
gagctcaaca	tccaggtgca	cggcgggtatt	ggctttacct	gggagcatga	cgcgcatctg	960
catctgcgcc	gggcgttggt	gaccgtggga	ttgttcggcg	gtgatgcgcc	cgcccgagac	1020
gttttcgagc	gcaccgcggc	tggcgttacc	cgggcgatca	gcttggacct	gccggcacag	1080
gccgaggagc	tgcgcgcccc	catccgttcg	gacgccgctg	aaatcgctgc	tctggaaaag	1140
gatgcacagc	gcgacaagct	gatcgagacg	ggctatgtga	tgccgcattg	gcccaggccg	1200
tggggtcgtg	ccgcggggcg	ggtggagcag	ttggtgatcg	aggaagagtt	cagcgcgggc	1260
ggcatcgagc	gcccggatta	ctcgatcacc	gggtgggtga	tcttgacgct	gattcagcac	1320
ggaacgcctt	ggcagattga	aagattcgtc	gagaaagcgc	tgcgccagca	ggagatatgg	1380
tgccaactgt	tctccgaacc	tgacgcgggg	tctgacgcgg	cctcgggtcaa	gaccgcgcga	1440
actcgggtgg	agggcggtcg	gaagatcaac	gggcaaaagg	tgtggaccag	cggagcgcag	1500
tactgcgcgc	gtggcctggc	taccgtgcgt	accgatccgg	atgcccccaa	acacgctggc	1560
atcaccacgg	tgatcatcga	catgttggtc	cccgggtgtcg	aggtgcggcc	gctgcggcag	1620
atcaccggcg	actcggaatt	caacgaggtg	ttcttcaacg	atgtcttcgt	ccccgatgag	1680
gacgttgctg	gggcgccgaa	ctccgggtgg	acggtggcgc	gggcaacgct	gggcaacgag	1740
cgggtcagca	tcggcggcag	tggctcgtac	tacgaagcaa	tggcggcgaa	gctggtgcaa	1800
ttggtccagc	ggcggtcaga	tgcgtttgcg	ggcgccccaa	ttcgagtcgg	cgctttcctc	1860
gcagaggatc	acgcactgcg	gctgctgaac	ctgcgccgtg	ccgctcgag	cgtcgaagga	1920
gccggccctg	gtccggaggg	caacatcacc	aagctcaaag	tggcagagca	catgatcgag	1980

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ggcgccgcca tcgcggcgcg gctatggggg cccgagattg cgttgctgga cggccccggc 2040
 aggggtgattg gccgaacggt gatgggcgcc cgtggcatgg cgatcgccgg cggcacgtcg 2100
 gaggtgaccc gcaatcagat tgccgagcgg atcctgggca tgccgcgtga tccccgtatt 2160
 agc 2163

<210> 221

<211> 141

<212> PRT

<213> Mycobacterium tuberculosis

<400> 221

Met Val Lys Asp Leu Asp Arg Arg Leu Ala Gly Cys Leu Pro Ala Val
 1 5 10 15

Leu Ser Leu Phe Arg Leu Val Tyr Gly Leu Leu Phe Ala Gly Tyr Gly
 20 25 30

Ser Met Ile Leu Phe Gly Trp Pro Val Thr Ser Ala Gln Pro Val Glu
 35 40 45

Phe Gly Ser Trp Pro Gly Trp Tyr Ala Gly Val Ile Glu Leu Val Ala
 50 55 60

Gly Leu Leu Ile Ala Thr Gly Leu Phe Thr Arg Ala Val Ala Phe Val
 65 70 75 80

Ala Ser Gly Glu Met Ala Val Ala Tyr Phe Trp Met His Gln Pro Tyr
 85 90 95

Ala Leu Trp Pro Ile Gly Gly Pro Pro Asp Gly Asn Gly Gly Thr Pro
 100 105 110

Ala Ile Leu Phe Cys Phe Gly Phe Phe Leu Leu Val Phe Thr Gly Gly
 115 120 125

Gly Ile Tyr Ser Ile Asp Ala Arg Arg Thr Val Thr Ala
 130 135 140

<210> 222

-280-

<211> 423

<212> DNA

<213> Mycobacterium tuberculosis

<400> 222

```

atggtgaaag atctcgaccg tcggctcgcc ggctgtttgc cggctgtgct gagcctcttt      60
cggttggtat acgggctgct gttcgccggc tacggatcga tgatcctttt cggctggccc      120
gtcacctcgg ctcaaccctg cgaatttgga tcctggcccg gctggtatgc cggggtcacg      180
gagttggtgg caggtctgct gatcgcaacc gggctgttta ccgcgctgt ggcgttcggt      240
gcctcggggc aaatggcggt cgctacttc tggatgcacg aaccgatgc actgtggccg      300
atcggcggtc caccggacgg caatggcgga actccggcga tactgttctg ctccggcttc      360
ttctgctggg tggtcaccgg tgggtgggac tactcaattg atgctcgacg cactgtcact      420
gca                                                                    423

```

<210> 223

<211> 437

<212> PRT

<213> Mycobacterium tuberculosis

<400> 223

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Val Val Ser Tyr Val Val Ala Leu Pro Glu Val Met Ser Ala Ala Ala
1              5              10              15

Thr Asp Val Ala Ser Ile Gly Ser Val Val Ala Thr Ala Ser Gln Gly
          20              25              30

Val Ala Gly Ala Thr Thr Thr Val Leu Ala Ala Ala Glu Asp Glu Val
          35              40              45

Ser Ala Ala Ile Ala Ala Leu Phe Ser Gly His Gly Gln Asp Tyr Gln
          50              55              60

Ala Leu Ser Ala Gln Leu Ala Val Phe His Glu Arg Phe Val Gln Ala
65              70              75              80

```

Leu Thr Gly Ala Ala Lys Gly Tyr Ala Ala Ala Glu Leu Ala Asn Ala
85 90 95

Ser Leu Leu Gln Ser Glu Phe Ala Ser Gly Ile Gly Asn Gly Phe Ala
100 105 110

Thr Ile His Gln Glu Ile Gln Arg Ala Pro Thr Ala Leu Ala Ala Gly
115 120 125

Phe Thr Gln Val Pro Pro Phe Ala Ala Ala Gln Ala Gly Ile Phe Thr
130 135 140

Gly Thr Pro Ser Gly Ala Ala Gly Phe Asp Ile Ala Ser Leu Trp Pro
145 150 155 160

Val Lys Pro Leu Leu Ser Leu Ser Ala Leu Glu Thr His Phe Ala Ile
165 170 175

Pro Asn Asn Pro Leu Leu Ala Leu Ile Ala Ser Asp Ile Pro Pro Leu
180 185 190

Ser Trp Phe Leu Gly Asn Ser Pro Pro Pro Leu Leu Asn Ser Leu Leu
195 200 205

Gly Gln Thr Val Gln Tyr Thr Thr Tyr Asp Gly Met Ser Val Val Gln
210 215 220

Ile Thr Pro Ala His Pro Thr Gly Glu Tyr Val Val Ala Ile His Gly
225 230 235 240

Gly Ala Phe Ile Leu Pro Pro Ser Ile Phe His Trp Leu Asn Tyr Ser
245 250 255

Val Thr Ala Tyr Gln Thr Gly Ala Thr Val Gln Val Pro Ile Tyr Pro
260 265 270

Leu Val Gln Glu Gly Gly Thr Ala Gly Thr Val Val Pro Ala Met Ala
275 280 285

Gly Leu Ile Ser Thr Gln Ile Ala Gln His Gly Val Ser Asn Val Ser
290 295 300

Val Val Gly Asp Ser Ala Gly Gly Asn Leu Ala Leu Ala Ala Ala Gln
305 310 315 320

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Tyr Met Val Ser Gln Gly Asn Pro Val Pro Ser Ser Met Val Leu Leu
325 330 335

Ser Pro Trp Leu Asp Val Gly Thr Trp Gln Ile Ser Gln Ala Trp Ala
340 345 350

Gly Asn Leu Ala Val Asn Asp Pro Leu Val Ser Pro Leu Tyr Gly Ser
355 360 365

Leu Asn Gly Leu Pro Pro Thr Tyr Val Tyr Ser Gly Ser Leu Asp Pro
370 375 380

Leu Ala Gln Gln Ala Val Val Leu Glu His Thr Ala Val Val Gln Gly
385 390 395 400

Ala Pro Phe Ser Phe Val Leu Ala Pro Trp Gln Ile His Asp Trp Ile
405 410 415

Leu Leu Thr Pro Trp Gly Leu Leu Ser Trp Pro Gln Ile Asn Gln Gln
420 425 430

Leu Gly Ile Ala Ala
435

<210> 224

<211> 1311

<212> DNA

<213> Mycobacterium tuberculosis

<400> 224

gtggtgtcctt	atgttggtgc	gttgccggag	gtgatgtccg	cgcgggccac	agacgtggct	60
tcgattgggtt	cggtgggtgc	gacggcgagc	caggggtgtcg	cgggtgccac	cacgacggta	120
ttagccgctg	ccgaggacga	gggtgtcagcc	gcgatcgcg	ctttgttttc	cggccatggt	180
caggactatc	aagctccttag	cgcacagctt	gcggtgtttc	atgagcgggt	tgtgcaggca	240
ttgacaggcg	cggccaaggg	gtatgccgcc	gccgagctgg	ccaacgcttc	gctgtttgcag	300
agtgaattcg	ccagcggtat	cgggaacggg	tttgccacga	ttcaccagga	aattcagcgg	360
gccccacagg	cgctggccgc	cggattcacg	caggttccgc	ctttcgcggc	ggcgcaggca	420

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```

gggatcttca ccggcacgcc gtcaggggct gccggattcg acatcgcttc gctgtggccg      480
gtgaaacccc tgctgagttt gtctgcgctc gaaactcact ttgcaatccc aaacaatcca      540
cttttagcgc tcattgccag cgacataccg ccgctgtcgt ggttttcttg caactcccca      600
ccgccgttgc tgaactcgct gctgggacag acggtccagt acaccaccta tgacgggatg      660
agcgtcgtgc agatcacgcc ggctcatcca accggcgaat acgtgggttg cattcacggc      720
ggcgcgttta tcctgccgcc gtcaatcttc cactggctca actactcggt gacggcttac      780
cagaccggcg cgaccgtgca agtgccgatt tacccggttg tgcaggaagg aggcactgcc      840
gggacggtag taccggcgat ggccgggctc atctccacgc aaatcgcgca acacggggtc      900
tccaacgtca gcgtggtcgg ggactccgcg ggcggcaacc tcgcactggc ggccgccccaa      960
tacatggtga gccagggcaa cccagtaccg tcgtccatgg tgttgctgtc cccgtggctc     1020
gatgtgggga cctggcagat cagccaggcg tgggcaggca atcttgcggt caacgacccg     1080
ctggtcagtc cgctgtatgg gtcgctgaac ggtcttcgcg cgacgtatgt ctattcgggc     1140
tcgcttgatc cgctcgaca acaagcgggt gtccctcgagc acacagccgt agtccaagga     1200
gcgccgttca gcttcgtact ggccccctgg caaatccacg actggatact gtcaccccc     1260
tgggggtttgc tgtcctggcc gcagattaac cagcaactcg gtatcgccgc c              1311

```

<210> 225

<211> 527

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 225

```

Met Arg Ser Trp Trp Gly Trp Gly Thr Val Glu Asp Ala Leu Ser Asp
1           5              10              15

```

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Gln Glu Thr Gln Ala Leu Gln Ser Arg Val Ala Ala Leu Val Ser Gly
20              25              30

```

```

His Asp Leu Ser Asp His Pro Pro Pro Asp Leu Thr Ala Leu Gly Leu
35              40              45

```

```

Ala Ala Pro Arg Val Ser Pro Pro Ala Ser Leu Ala Ala Leu Cys Ser
50              55              60

```

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Ser Asp Leu Val Asp Arg Ala Gly His Ala Arg Gly Lys Ala Tyr Arg
65 70 75 80

Asp Ile Ala Arg Asn Leu Gln Gly Gln Leu Asp His Leu Pro Asp Leu
85 90 95

Ile Ala Arg Pro Arg Ser Glu Gln Asp Val Ile Asp Val Leu Asp Trp
100 105 110

Cys Ala Arg Glu Gly Ile Ala Val Ile Pro Tyr Gly Gly Gly Ser Ser
115 120 125

Val Val Gly Gly Val Glu Pro Arg Phe Asp Glu Pro Val Val Thr Val
130 135 140

Asp Val Thr Ala Met Ser Ala Val Leu Glu Ile Asp Arg Val Ser Arg
145 150 155 160

Ala Ala Arg Ile Gln Ala Gly Ala Phe Gly Pro Ser Ile Glu His Gln
165 170 175

Leu Arg Pro His Asp Leu Thr Leu Arg His Phe Pro Gln Ser Phe Gly
180 185 190

Phe Ser Thr Leu Gly Gly Trp Leu Ala Thr Arg Ser Gly Gly His Phe
195 200 205

Ala Thr Leu Tyr Thr His Ile Asp Asp Leu Thr Glu Ser Leu Arg Ile
210 215 220

Val Thr Pro Val Gly Ile Ser Glu Ser Arg Arg Leu Pro Gly Ser Gly
225 230 235 240

Ala Gly Pro Ser Pro Asp Arg Leu Phe Leu Gly Ser Glu Gly Thr Leu
245 250 255

Gly Ile Ile Thr Glu Ala Trp Met Arg Leu Gln His Arg Pro Arg Trp
260 265 270

Gln Val Thr Val Ser Val Val Phe Asp Asp Trp Ala Ala Ala Val Ala
275 280 285

Ala Thr Arg Thr Ile Ala Gln Ala Gly Leu Tyr Pro Ala Asn Cys Arg
290 295 300

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Leu Leu Asp Pro Ala Glu Ala Leu Leu Asn Ala Gly Thr Ser Val Gly
 305 310 315 320

Gly Gly Leu Leu Val Leu Ala Phe Glu Ser Ala Asp His Pro Ile Asp
 325 330 335

Pro Trp Leu His Arg Ala Val Ala Ile Thr Ala Glu His Gly Gly Thr
 340 345 350

Val Thr Ala Gln Arg Ser Arg Gly Thr Thr Ser Asp Ala Thr Glu His
 355 360 365

Asn Ala Ala Ala Asn Trp Arg Ser Ala Phe Leu Arg Met Pro Tyr Gln
 370 375 380

Arg Asp Ala Leu Val Arg Arg Gly Val Ile Ala Glu Thr Phe Glu Thr
 385 390 395 400

Ala Cys Thr Trp Asp Gly Phe Asp Thr Leu His Ala Ala Val Thr Asp
 405 410 415

Ala Ala Arg Thr Ala Ile Trp Lys Val Cys Gly Thr Gly Val Val Thr
 420 425 430

Cys Arg Phe Thr His Val Tyr Pro Asp Gly Pro Ala Pro Tyr Tyr Gly
 435 440 445

Ile Tyr Ala Gly Gly Arg Trp Gly Ser Leu Asp Ala Gln Trp Asp Glu
 450 455 460

Ile Lys Ala Ala Val Ser Glu Ala Ile Ser Ala Ser Gly Gly Thr Ile
 465 470 475 480

Thr His His His Ala Val Gly Arg Asp His Arg Ala Trp Tyr Asp Arg
 485 490 495

Gln Arg Pro Asp Pro Phe Ala Ala Ala Leu Arg Ala Ala Lys Ser Ala
 500 505 510

Leu Asp Pro Ala Gly Ile Leu Asn Pro Gly Val Leu Leu Gly Arg
 515 520 525

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<211> 1581

<212> DNA

<213> Mycobacterium tuberculosis

<400> 226

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atgcgttcgt ggtggggttg gggcacagtc gaggacgcgc tctccgatca ggagacgcaa      60
gcgctacagt cgcgagtcgc ggcactggtg tccggccatg acctgagcga ccacccgccg      120
ccggacctga ccgcgctcgg tttggcggcc ccacgggtca gcccgcgggc atcgctggcc      180
gcgctctgct caagcgatct cgtcgatcgg gccggacacg cgcgcggcaa agcgtatcgc      240
gacatcgcac gcaacctgca gggccagctc gaccacctgc ccgacctcat cggccgaccc      300
cgcagcgcgc aggacgtgat cgacgtgctg gattgggtgtg cgcgcgaggg gattgcggtc      360
atcccatacg gtggtggcag ctcggtggtt ggcggtgtcg agccgcgctt cgatgagccg      420
gtggtcacgg tcgacgtcac tgccatgagc gcggtgcttg agattgaccg tgtcagccgt      480
gccgcgcgca tccaggcggg tgcgttcggc cctcgatcg agcatcagct tcgcccacac      540
gatttgacac tgcgccatth cccgcagtc ttcggcttct cgactctcgg tggctggttg      600
gccacccgct ccggcggaca cttcgccacg ctctataccc atatcgacga cttgaccgaa      660
tcgctgcgga ttgtcacccc ggtggggatc agcgagtccc ggcggctgcc cggaaagcgg      720
gcgggacct ccccgaccg gttgttcctc gggtcgagg ggacgcttgg catcatcacc      780
gaggcggtga tgcggctgca acaccgtccg cgatggcagg tcacgggtgtc cgtggtgttt      840
gacgactggg ccgccgcggc cgccgcgacc cggacgatcg ctacggcggg gctgtacccg      900
gccaactgcc ggctgttgga tccggccgag gcgttgctga atgccggcac gtccgttggt      960
ggcgggctgt tgggtgttggc gttcgagtct gccgaccacc cgatagaccc gtggctgcac     1020
cgggcgggtg cgatcacgc cgaacacggc ggcacggtga ccgcgcaacg tagccgcgga     1080
actacaagcg acgcaacgga acacaacgca gccgcgaact ggcgctcggc gtttctgcgc     1140
atgccgtatc aacgagacgc gctggttcgc cgcggagtta tcgccgaaac attcgaaacc     1200
gcttgcacct gggacggatt cgatactcta catgccgcgg tgaccgatgc cgctcggacc     1260
gcgatctgga aggtatgcgg gaccggagta gtgacctgtc gattcaacca tgtctacccg     1320
gacggccccg ctcttacta cggcatctat gccggcgggc gctgggggtc gctcgacgcg     1380
cagtgggacg agatcaaggc tgccgtgtcc gaggcgatca gcgccagtgg cggtagcatc     1440
accacaccac atgcggtcgg tcgcgaccac cgcgcttggt atgaccggca gcgtcccgcac     1500
```

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ccgttcgcgg cggccctgcg ggcggcgaag tccgcactcg acccggccgg gatcctcaac 1560
 ccaggggtgt tgctcggtcg c 1581

<210> 227

<211> 145

<212> PRT

<213> Mycobacterium tuberculosis

<400> 227

Met Thr Ser Phe Ala His Pro Gly Thr Arg Gly Leu Ser Thr Val Phe
 1 5 10 15

Gly Leu Met Met Val Gly Ser Ala Ala Val Gly Ser His Gly Leu Ala
 20 25 30

Val Val Val Gly Leu Ala Ala Val Ile Ala Val Gly Val Ala Ala Val
 35 40 45

Phe Arg Leu Ala Ala Thr Leu Ala Val Val Leu Ser Val Val Met Ile
 50 55 60

Val Val Ser Gly Pro Thr His Val Leu Ala Ala Leu Ser Gly Phe Cys
 65 70 75 80

Ala Ala Val Tyr Leu Val Cys Arg Tyr Gly Ala Gly Val Val Ala Gly
 85 90 95

Ser Trp Pro Thr Thr Val Ala Ala Val Gly Phe Thr Phe Ala Gly Leu
 100 105 110

Ala Ala Thr Ser Phe Pro Leu Gln Val Pro Trp Leu Pro Leu Ala Ala
 115 120 125

Pro Leu Ala Val Leu Ala Thr Tyr Val Leu Ala Thr Arg Pro Phe Ser
 130 135 140

Arg
 145

<210> 228

-288-

<211> 435

<212> DNA

<213> Mycobacterium tuberculosis

<400> 228

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atgacctcgt ttgcgcaccc ggggtactcgt gggctctcca cgggtgttcgg actgatgatg      60
gtgggggtcgg ccgctgtggg atcgcacggg ctggctgttg tcgtggggct tgccgcggtg      120
attgcggtag ggggtggcggc ggtgtttcgc ctggcgggcaa cgcttgccgt ggtgtttgtcg      180
gtggtgatga tcgtggtgtc cggcccgacg catgtgcttg ccgcattgtc ggggttttgc      240
gccgccgtct acctggtgtg ccgatacggg gccggtgttg tcgccgggag ctggccgacg      300
accgttgccg ccgttggttt cacgttcgct gggttggctg cgacgtcggt cccgctgcaa      360
gtgccatggc tgccgttggc ggcaccgttg gccgtgttgg ctacctacgt gctggccacc      420
cgtccgttct cgagg                                         435

```

<210> 229

<211> 119

<212> PRT

<213> Mycobacterium tuberculosis

<400> 229

```

Leu Arg Leu Gly Ala Gly Phe Arg Lys Pro Val Pro Thr Leu Leu Leu
1           5           10          15

Glu His Arg Ser Arg Lys Ser Gly Lys Asn Phe Val Ala Pro Leu Leu
          20          25          30

Tyr Ile Thr Asp Arg Asn Asn Val Ile Val Val Ala Ser Ala Leu Gly
          35          40          45

Gln Ala Glu Asn Pro Gln Trp Tyr Arg Asn Leu Pro Pro Asn Pro Asp
          50          55          60

Thr His Ile Gln Ile Gly Ser Asp Arg Arg Pro Val Arg Ala Val Val
65          70          75          80

```

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Ala Ser Ser Asp Glu Arg Ala Arg Leu Trp Pro Arg Pro Val Asp Ala
 85 90 95

Tyr Ala Asp Phe Asp Ser Cys Gln Ser Trp Thr Glu Arg Gly Ile Pro
 100 105 110

Val Ile Ile Leu Arg Pro Arg
 115

<210> 230

<211> 357

<212> DNA

<213> Mycobacterium tuberculosis

<400> 230
 ttgcgactcg ggcgcggatt ccgcaaaccg gtgccgacac tgctactcga acaccggagc 60
 cgcaagtccg gcaagaactt cgtcgcacca ctgctttaca tcaccgaccg taacaatgtc 120
 atcgtcgttg cctctgccct tgggcaggca gaaaaccgc agtggtatcg caacctgccg 180
 cccaatcccg acaccacat tcagatcgga tccgatcgcc gcccggtgag agccgtcgtg 240
 gccagctcgg acgagcgggc gcgcctatgg ccgcgccag tagacgccta cgccgacttc 300
 gattcttgcc aaagctggac cgagcgtggg attccggtga tcattcttgcg gccacgc 357

<210> 231

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 231

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
 20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

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Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 232

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 232

atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtcgcagaga tccgcggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccgt 120
 ctacttggtg ttggctgcgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac cacgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 233

<211> 133

<212> PRT

<213> Mycobacterium tuberculosis

<400> 233

Met Pro Asp Val Asp Trp Asn Met Leu Arg Gly Asn Ala Thr Gln Ala
 1 5 10 15

Ala Ala Gly Ala Tyr Val Pro Tyr Ser Arg Phe Ala Val Gly Ala Ala

-291-

20

25

30

Ala Leu Val Asp Asp Gly Arg Val Val Thr Gly Cys Asn Val Glu Asn
 35 40 45

Val Ser Tyr Gly Leu Thr Leu Cys Ala Glu Cys Ala Val Val Cys Ala
 50 55 60

Leu His Ser Thr Gly Gly Gly Arg Leu Leu Ala Leu Ala Cys Val Asp
 65 70 75 80

Gly His Gly Ser Val Leu Met Pro Cys Gly Arg Cys Arg Gln Val Leu
 85 90 95

Leu Glu His Gly Gly Ser Glu Leu Leu Ile Asp His Pro Val Arg Pro
 100 105 110

Arg Arg Leu Gly Asp Leu Leu Pro Asp Ala Phe Gly Leu Asp Asp Leu
 115 120 125

Pro Arg Glu Arg Arg
 130

<210> 234

<211> 399

<212> DNA

<213> Mycobacterium tuberculosis

<400> 234
 atgcctgatg tcgattggaa tatgctgcgg ggcaatgcaa cccaggcagc agccggagcc 60
 tatgtgccgt attcgcggtt tgcggtgggt gcggccgcac tggtcgacga tggtcgcgtg 120
 gtgaccggat gcaacgtgga aaacgtctcg tatggcttga ctttgtgcgc cgaatgtgcg 180
 gtggtgtgcg ccctgcattc gaccggcggc ggccggctgc tcgcgctggc ctgcgtcgac 240
 ggccatggat ccgtgctgat gccgtgcggg cgatgccgtc aggtgctgct cgaacacggg 300
 ggttccgagc tactgatcga ccatccggtg cgaccccgcc ggctcggcga cctgctgccc 360
 gacgccttcg gcctcgacga cctccccggg gaacgccgg 399

<210> 235

-292-

<211> 204

<212> PRT

<213> Mycobacterium tuberculosis

<400> 235

Met Ser Val Gln Thr Asp Pro Ala Leu Arg Glu His Pro Asn Arg Val
1 5 10 15

Asp Trp Asn Ala Arg Tyr Glu Arg Ala Gly Ser Ala His Ala Pro Phe
20 25 30

Ala Pro Val Pro Trp Leu Ala Asp Val Leu Arg Ala Gly Val Pro Asp
35 40 45

Gly Pro Val Leu Glu Leu Ala Ser Gly Arg Ser Gly Thr Ala Leu Ala
50 55 60

Leu Ala Ala His Gly Arg Gln Val Thr Ala Ile Asp Val Ser Asp Val
65 70 75 80

Ala Leu Leu Gln Leu Asp Ser Glu Ala Val Arg Arg Gly Val Ala Asp
85 90 95

Arg Leu Asn Leu Val Gln Ala Asp Leu Gly Cys Trp Glu Pro Gly Glu
100 105 110

Thr Arg Phe Ala Leu Val Leu Ser Arg Leu Phe Trp Asp Ala Ala Ile
115 120 125

Phe His Arg Ala Cys Glu Ala Val Met Pro Gly Gly Val Leu Ala Trp
130 135 140

Glu Ser Leu Ala Leu Ser Gly Ala Glu Ala Gly Thr Ala Ser Ala Lys
145 150 155 160

Arg Arg Val Lys Pro Gly Glu Pro Ala Cys Leu Leu Pro Ala Asp Phe
165 170 175

Thr Val Val His Glu Gly Gln Gly Asn Cys Asp Ser Ala Pro Ser Arg
180 185 190

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Ile Met Ile Ala Arg Arg Ser Pro Leu Pro Gly Ala
 195 200

<210> 236

<211> 612

<212> DNA

<213> Mycobacterium tuberculosis

<400> 236

atgagcgtgc agacggatcc ggcgctgcgg gagcacccca accgcgtcga ctggaacgcg 60
 cgatacgaac gcgcgggttc ggcgcacgcg ccgtttgccc cggcgccttg gctcgccgat 120
 gtcctcagag caggcggttc ggacgggtccc gttctggagt tagccagcgg tcgatcgggt 180
 accgcactgg cgttggccgc ccacggccgc caggtcaccg caatcgatgt gtccgatgtc 240
 gcgctgctgc agctggacag cgaggccgtg cgtcgaggcg tggccgatcg gctcaacctc 300
 gtgcaggccg acttgggctg ctgggaacct ggcgagacgc gtttcgcgct ggtgctcagc 360
 aggctctttt gggatgcggc gatatttcac cgcgcctgtg aggcggtgat gccaggcggc 420
 gtattggcat gggagtcgct ggctctcagt ggcgccgagg cgggcacagc cagcgcgaag 480
 cgacgtgtca agccgggaga gccagcgtgt ctgcttcctg ccgacttcac cgttgtacac 540
 gaggggcagg gtaactgcga ttcgggcggc tcgcggatca tgatcgcgcg gcgctcaccg 600
 ttgccagggg ca 612

<210> 237

<211> 264

<212> PRT

<213> Mycobacterium tuberculosis

<400> 237

Val Leu Ala Ser Cys Pro Ala Arg Ser Gly Ala Ala Val Ala Asp Ala
 1 5 10 15

Ile Lys Ser Ala Val Gly Val Gln Pro Ser Gly Val Glu His Lys Thr
 20 25 30

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Leu Arg Arg Met Asp Leu Val Arg Tyr Leu Ala Gly Gly His Thr Thr
 35 40 45

Tyr Pro Pro Glu Gly Phe Val Ala Gly Ser Asp Val Ile Gly Thr Thr
 50 55 60

Asn Pro Ala Ala Ala Gln Ala Ile Val Ala Ala Ile Gly Thr Trp Pro
 65 70 75 80

Pro Ala Ala Gly Arg Ala Ser Ala Leu Ile Asp Ser Leu Gly Gly Ala
 85 90 95

Val Gly Asp Met Asp Pro Glu Gly Ser Ala Phe Pro Trp Cys Arg Gln
 100 105 110

Ser Ala Val Val Gln Trp Tyr Val Asn Thr Pro Ser Asp Gly Gln Val
 115 120 125

Ala Thr Ala Asn Lys Trp Leu Ser Asp Ala His His Ala Val Gln His
 130 135 140

Phe Ser Val Gly Gly Tyr Val Asn Tyr Leu Glu Ala Asn Ala Ala Ala
 145 150 155 160

Ser Gln Tyr Phe Gly Ala Asn Leu Ser Arg Leu Thr Thr Val Arg Arg
 165 170 175

Lys Tyr Asp Pro Asp Arg Ile Met Tyr Ser Gly Leu Asp Phe Ser Thr
 180 185 190

Arg Gln Val Ala Glu Arg Leu Leu Pro Ala Leu Gly Phe Arg Val Arg
 195 200 205

Phe Gly Val Leu Val Ile Arg Cys Ala Leu Cys Thr Asp Thr Val Lys
 210 215 220

Arg Leu Gly Thr Leu Pro Asn Leu Thr Trp Ser Arg Leu Lys Val Asn
 225 230 235 240

Val Ala Val Thr Gln Glu Gln Ala Gly Val Met Asp Leu Pro Ala Leu
 245 250 255

Pro Val Arg Arg Thr Pro Arg Arg
 260

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<210> 238

<211> 792

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 238

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gtgctggcga gctgcccggc gcggtccggc gcggctgtcg cggatgcgat caagtccgcg      60
gttggagtgc aaccagtg agttgagcac aagacgtgc gccgtatgga cctggtgagg      120
tatctggccg gcggccatac gacctatccg ccggagggct tcgtggctgg atccgatgtc      180
atcgggacga cgaatccggc cgcgcccaa gccatcgtcg ccgccatcgg aacatggcca      240
cccgtgcgg gccgcgcgtc ggctctgata gattcgtgg gcggcgcggt gggcgacatg      300
gacccggagg gtcggcatt tccctggtgc cgccagtcgg ctgtggtgca gtggtatgtc      360
aacaccccc aacacggcca ggtggcgacg gccaacaaat ggctgagcga cgacaccac      420
gcggtgcaac acttttcggt cggcggctat gtcaactacc tggaggccaa cgccgcggcg      480
tcacaatact tcggcgcgaa cctgtcgcgg ctgaccacag tcggcgcgaa gtacgatccc      540
gaccggatca tgtactcggg tctggatttc tctaccagac aggtcgtga acgactttta      600
cccgtctcgc gctttcgagt gaggttcggg gttttggtaa tcaggtgcgc actgtgcact      660
gacactgtga aacgcttggg aactttgcc aaccttacgt ggtcgcgctt aaaagtgaac      720
gtcgcagtga cccaagaaca ggctggggtc atggatttgc cggcgtgcc ggttcggcgc      780
acgccgcggc gg

```

<210> 239

<211> 123

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 239

```

Val Ser Ala Ala Thr Asp Leu Tyr Ala Val His Gln Ala Leu Ala Gly
1           5           10          15

```

```

Glu Ser Arg Ala Ile Pro Thr Gly Ser Cys Pro Thr Val Gly Val Ala

```

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	20		25		30
Gly	Leu	Thr	Leu	Gly	Gly
	35		40		45
Leu	Thr	Cys	Asp	Ala	Leu
	50		55		60
Asp	Ala	Val	Ser	Ala	Ser
	65		70		75
Leu	Arg	Gly	Gly	Gly	Gly
		85		90	
					95
Phe	Ala	Arg	Phe	Pro	Thr
		100		105	
					110
Ala	Pro	Ser	Ala	Ala	Ala
	115			Gln	Val
				Leu	Val
					Gly

<210> 240

<211> 369

<212> DNA

<213> Mycobacterium tuberculosis

<400> 240

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gtgtcggccg cgaccgatct ctatgcggtc catcaagcgt tggccggtga gagccgggcg      60
attccgaccg gcagctgccc gaccgtgggt gtggcggggt tgaccctggg cggcggggtta    120
ggcgccgatt ctcgccatgc ggggttgacc tgcgatgcgc tcaagtcggc gacggtggtg      180
ttgcccgggc gtgatgcggg gagcgcgctc gccgacgacc acgcggagct gttctgggcg      240
cttcgtggcg gcggggggcg caacttcggg gtgacgacat cgatgacgtt cgcgaggttc      300
cccaccgagg actgcatgtt cgtccgtgtc gatttcgcgc cgtctgcggc cgcgcagggtg      360
ctggtcggc                                     369

```

<210> 241

<211> 213

<212> PRT

-297-

<213> Mycobacterium tuberculosis

<400> 241

Met Arg Arg Arg Ala Met Thr Lys Met Asp Glu Ala Ser Asn Pro Cys
 1 5 10 15

Gly Gly Asp Ile Glu Ala Glu Met Cys Gln Leu Met Arg Glu Gln Pro
 20 25 30

Pro Ala Glu Gly Val Val Asp Arg Val Ala Leu Gln Arg His Arg Asn
 35 40 45

Val Ala Leu Ile Thr Leu Ser His Pro Gln Ala Gln Asn Ala Leu Asn
 50 55 60

Leu Ala Ser Trp Arg Arg Leu Lys Arg Leu Leu Asp Asp Leu Ala Gly
 65 70 75 80

Glu Ser Gly Leu Arg Ala Val Val Leu Arg Gly Ala Gly Asp Lys Ala
 85 90 95

Phe Ala Ala Gly Ala Asp Ile Lys Glu Phe Pro Asn Thr Arg Met Ser
 100 105 110

Ala Ala Asp Ala Ala Glu Tyr Asn Glu Ser Leu Ala Val Cys Leu Arg
 115 120 125

Ala Leu Thr Thr Met Pro Ile Pro Val Ile Ala Ala Val Arg Gly Leu
 130 135 140

Ala Val Gly Gly Gly Cys Glu Leu Ala Thr Ala Cys Asp Val Cys Ile
 145 150 155 160

Ala Thr Asp Asp Ala Arg Phe Gly Ile Pro Leu Gly Lys Leu Gly Val
 165 170 175

Thr Thr Gly Phe Thr Glu Ala Asp Thr Val Ala Arg Leu Ile Gly Pro
 180 185 190

Ala Ala Leu Lys Tyr Leu Leu Phe Ser Gly Glu Leu Ile Gly Ile Glu
 195 200 205

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Glu Ala Ala Arg Trp
210

<210> 242

<211> 639

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 242

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atgaggcggc gtgcaatgac gaagatggac gaggctagca atccgtgcgg cggggacatc      60
gaagctgaga tgtgccagtt gatgcgcgag caaccacccg ccgaaggcgt cgtcgatcgt      120
gtcgcgctgc aacgccatcg aaacgttgcg ttgatcacgc tgagccatcc gcaggcgag      180
aacgcactca acctggcgag ctggcgtcgg ctgaagcggc tgctggacga tctcgccggc      240
gaatcggggc tgcgggcggg ggtgctgcgg ggcgcgggtg acaaggcgtt cgcgcgggg      300
gccgacatca aggagtttcc gaacacccgc atgagcgccg cggacgccgc ggagtacaac      360
gagagcctgg ccgtctgcct gagggcggtg accacgatgc cgatcccagt catcgcggcg      420
gtccgggggc tcgccgtcgg tggcggtgtg gagctggcga cggcctgcga tgtgtgcatc      480
gcgaccgacg acgcgcgctt cggcatcccg ctgggcaagc tcggcgtcac gacgggcttc      540
accgaggcgg acaccgtcgc gcgcctcatc ggtccggcgg cgctgaagta tctgttggtc      600
agcggagaac tgatcggcat tgaggaagcc gcccgctgg      639

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<210> 243

<211> 467

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 243

Val Ala Asp Arg Leu Asn Val Ala Glu Arg Leu Ala Glu Gly Arg Pro
1 5 10 15

Ala Ala Glu His Thr Gln Ser Tyr Val Arg Ala Cys His Leu Val Gly
20 25 30

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Tyr Gln His Pro Asp Leu Thr Ala Tyr Pro Ala Gln Ile His Asp Trp
 35 40 45

Tyr Gly Ser Glu Asp Gly Leu Asp Leu His Ala Leu Asp Ala Asp Cys
 50 55 60

Ala Gln Leu Arg Ala Ala Ala Ser Val Leu Met Glu Ala Leu Arg Met
 65 70 75 80

Glu Arg Ser Gln Val Ala Val Leu Ala Ala Ala Trp Thr Gly Ser Gly
 85 90 95

Ala Asp Ala Ala Val His Phe Val Gln Arg His Cys Glu Thr Gly Asn
 100 105 110

Ser Val Val Thr Glu Val Arg Ala Ala Ala Gln Arg Cys Glu Ser Leu
 115 120 125

Arg Asp Asn Leu Trp Gln Leu Val Asp Ser Lys Val Ala Thr Ala Ile
 130 135 140

Ala Ile Asp Glu Arg Ala Leu Ala Gln Arg Pro Ala Trp Leu Ala Ala
 145 150 155 160

Ala Glu Ala Leu Thr Thr Glu Gly Ala Asp Arg Pro Thr Ala Val Glu
 165 170 175

Val Val Arg Gln Gln Ile Gln Pro Tyr Val Asp Asp Asp Val Arg Asn
 180 185 190

Asp Trp Leu Thr Thr Met Arg Ser Thr Thr Ala Gly Val Ala Ala Ser
 195 200 205

Tyr Asp Ala Val Thr Asp Gln Leu Ala Ser Ala Pro Arg Ala His Phe
 210 215 220

Glu Ile Pro Asp Asp Leu Gly Pro Gly Arg Gln Pro Ser Pro Ala Ser
 225 230 235 240

Val Pro Ala Gln Pro Ser Ala Thr Ala Ala Ile Thr Pro Ala Ala Ala
 245 250 255

Leu Pro Pro Pro Asp Pro Val Pro Ala Val Thr Ser Arg Pro Val Thr
 260 265 270

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Pro Ser Asp Phe Gly Ser Ala Pro Gly Asp Gly Ser Ala Thr Pro Ala
 275 280 285

Gly Val Gly Ser Ala Gly Gly Phe Gly Asp Ala Gly Gly Thr Gly Gly
 290 295 300

Leu Gly Gly Phe Ala Gly Leu Ala Gly Leu Ala Asn Arg Ile Val Asp
 305 310 315 320

Ala Val Asp Ser Leu Leu Gly Ser Val Ala Glu Gln Leu Gly Asp Pro
 325 330 335

Leu Ala Ala Asp Asn Pro Pro Gly Ala Val Asp Pro Phe Ala Glu Asp
 340 345 350

Ala Ala Asp Asn Ala Asp Asp Gly Asp Asp Ala His Pro Glu Glu Ala
 355 360 365

Asp Glu Ala Ala Glu Pro Lys Glu Ala Thr Glu Pro Asp Glu Ala Asp
 370 375 380

Glu Val Asp Asp Ala Asp Glu Ser Val Pro Ala Glu Arg Ala Gln Asp
 385 390 395 400

Val Ala Glu Glu Ala Thr Leu Pro Pro Val Ala Glu Pro Pro Pro Pro
 405 410 415

Ala Ala Pro Pro Val Ala Glu Pro Pro Pro Pro Val Ala Ala Pro Ala
 420 425 430

Pro Pro Gly Ala Pro Glu Pro Ala Asn Gly Pro Ser Pro Glu Ala Leu
 435 440 445

Ser Glu Gly Ala Thr Pro Cys Glu Ile Ala Ala Asp Glu Leu Pro Gln
 450 455 460

Ala Gly Pro
 465

<210> 244

<211> 1401

<212> DNA

-301-

<213> *Mycobacterium tuberculosis*

<400> 244

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gtggctgacc ggttgaacgt cgctgagcgt ctgcccgagg gcaggcccg c agccgagcac      60
acgcaaagct acgtgcgggc ttgccacctg gtgggctacc aacatccga cctgaccgcc      120
taccttgccc agatccacga ctggtacggc agcgaagacg gacttgacct gcacgcgctc      180
gacgctgact gcgcgcagct gcgggctgcc gccagtgtgc tcatggaggc gctgcggatg      240
gagcgtagcc aggtcgccgt cttggcagcg gcatggacgg gatcgggggc cgacgcggcg      300
gtgcactttg tgcagcgtca ctgtgagact ggaaattcgg tggtcaccga agtcctgtgcc      360
gcggcccaac gctgcgaatc gctgcgcgac aacctctggc agctggtgga ctccaaagtc      420
gcgacggcca ttgcgatcga cgagcgtgcc ctggcgcagc ggccggcatg gttggctgcg      480
gccgaagcgc tcacgacgga gggggcagat cggccgacgg ccgtcgaagt ggttcgccaa      540
cagatacagc cctacgtgga cgacgatgtt cgcaacgact ggctgaccac gatgcgatcg      600
acaacggccg gtgtggcggc gtcgtatgat gcggtcaccg atcagctggc cagcgcgccg      660
cgcgcgcact tcgagattcc ggacgatctc gggcccggtc gccaaccttc tccggcatcg      720
gtgccggctc aaccgagcgc gacggcagcg attacgcccg cggccgctct tccccgccg      780
gatccggtgc cggccgtgac ctccgcggcca gtgacgccgt cggattttgg atcggcgcca      840
ggtgatggtt ccgcgacgcc ggccgggtgtt ggcagcgccg gtggtttcgg cgatgccggc      900
ggcaccggcg gtctgggcgg gtttgccggg cttgccgggc ttgccaaccg gatcgctgat      960
gcggtggata gcctgctggg ttcgggtggc gaacagctgg gggatccgtt ggcagctgac     1020
aatccgccgg gtgccgtcga tccgttcgct gaagacgcgg ccgacaacgc tgatgacggc     1080
gacgatgccc acccggaaga ggccgacgag gcagcggagc cgaaggaagc aacagagccc     1140
gacgaagcag acgaggtcga cgaccccgac gaatcggtgc ccgtgaacg tgcccaggat     1200
gtccgccagg aggccacgct gccgccggtc gccgaaccgc cggcgctgc cgcgcctccg     1260
gtccgccaac caccgcctcc ggtcgctgcg ccggcgccgc cgggtgcgcc ggaaccggcg     1320
aatgggcctt cgccggaagc gctgtccgag ggagccaccc cctgtgagat cgccgccgac     1380
gagcttccgc aggcgggggc g

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<210> 245

<211> 404

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<212> PRT

<213> Mycobacterium tuberculosis

<400> 245

Val Ser Pro His Arg Ala Val Ile Glu Ala Gly Pro Gly Ala Ile Arg
1 5 10 15

Arg Leu Cys Cys Gly Ala Asp Val Val Ala Asp Thr Ala Val Ser Ala
20 25 30

Ala Ala Leu Ala Ala Ile Asp Asp Gln Val Ala Leu Leu Asp Glu Arg
35 40 45

Pro Val Ala Val Asp Ser Leu Trp Phe Asp Ala Leu Arg Ser Val Ala
50 55 60

Val Asp His Arg Asp Gly Pro Val Val Val His Pro Ser Trp Trp Ser
65 70 75 80

Ala Ala Arg Val Glu Val Val Thr Ala Ala Ala Arg Thr Leu Thr Arg
85 90 95

Asp Val Val Val His Pro Arg Ser Trp Leu Leu Arg Gln Ala Ser Ser
100 105 110

Gly Val Ser Ala Ala Thr Val Val Val Glu Ile Ala Glu Arg Leu Val
115 120 125

Leu Val Ala Gly Ala Glu Val Ala Ala Val Ala Arg Arg Thr Asp Ala
130 135 140

Glu Ser Val Ala Gly Gln Val Gly Ser Val Ile Ala Arg Met Thr Arg
145 150 155 160

Gly Ile Thr Ala Val Val Leu Ile Asp Val Pro Ser Thr Val Ala Gly
165 170 175

Ala Ala Ala Leu Ala Ala Ala Ile Ala Gly Ala Val Arg Gly Thr Gly
180 185 190

Ser Ser Val Val Glu Ile Asp Gly Val Arg Leu Ala Arg Leu Ala Arg
195 200 205

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Ala Ala Leu Pro Pro Ser Asp Glu Pro Ala Asp Pro Ala Ala Arg Pro
 210 215 220

Ala Thr Arg Ser Arg Val Pro Thr Leu Ala Arg Val Ala Ala Ala Gly
 225 230 235 240

Val Ala Leu Ala Leu Leu Ala Pro Ala Ala Val Val Arg His Gly Ala
 245 250 255

Thr Thr Leu Gln Arg Pro Pro Thr Thr Leu Leu Val Glu Gly Arg Val
 260 265 270

Ala Leu Thr Ile Pro Ala Asp Trp Ser Thr Gln Arg Val Val Ser Gly
 275 280 285

Pro Gly Ser Ala Arg Val Gln Val Thr Ser Pro Ala Asp Pro Glu Val
 290 295 300

Ala Leu His Val Thr Gln Ser Pro Val Pro Gly Glu Thr Leu Pro Gly
 305 310 315 320

Thr Ala Gln Arg Leu Lys Arg Ala Ile Asp Ala Ser Pro Ala Gly Val
 325 330 335

Phe Val Asp Phe Asn Pro Ser Asp Ile Arg Ala Gly Arg Pro Ala Val
 340 345 350

Thr Tyr Arg Glu Val Arg Ala Gly His Gln Val Arg Trp Thr Ile Leu
 355 360 365

Leu Asp Gly Ala Val Arg Ile Ser Val Gly Cys Gln Ser Gly Pro Gly
 370 375 380

His Glu Asp Leu Leu Arg Glu Val Cys Ala Gln Ala Val Arg Ser Val
 385 390 395 400

His Ala Val Gly

<210> 246

<211> 1212

<212> DNA

-304-

<213> *Mycobacterium tuberculosis*

<400> 246

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ggcgagacg tagtcgcgga caccgcagtg tctgccgccg cgctggcggc gatcgacgac      120
caggtagcgc tgcctggacga acggccagtc gccgtggatt cgctgtgggt cgacgccctg      180
cgatcgggtg ccgtcgacca ccgtgacggc ccggtcgtcg tgcacccgtc gtggtggtcg      240
gcggtctggg tcgaggtggt caccgcagcc gcacgcacgc tgacccgcga tgcgtcgtg      300
caccgcgggt cgtggctgct gaggcaggcg tcctcggggg ttccggccgc aacggtggtg      360
gtggagatcg cggagcgact ggtgttggtg gccggcgccg aggtcgccgc ggtggcccg      420
cgacaggacg ccgagtcctg tgccggccag gtaggcagtg tcattgcgcg gatgacgcgg      480
ggtattaccg cgggtggtgct gatcgacgtg ccagtaacgg tcgccggggc ggcagcgctc      540
gcgggcgcaa tcgccggtgc ggtgcggggg accggtagca gcgtggtcga gatcgacggc      600
gtgcggtctg cgcggttggc cagggccgcc ctgccgcctt ccgacgagcc cgccgatccg      660
gcgggcgggc ctgccacccg ctctcgggtc ccgacacttg cccgggttgc ggccgcccgt      720
gtcgcccttg cgttactggc gccggctgcc gtggtccgcc acggtgcgac aaccctgcaa      780
agaccaccga cgacgcttct ggtagaggcg cgggtggcgc tgacgattcc ggcggactgg      840
tccacgcagc ggggtggtct ccgtcccggg tcggcgcggg tacaggtcac ttcaccggcc      900
gatcccagag tggcgttgca cgtcacacaa tcaccggttc ccggtgagac gctgcctggc      960
accgcgcagc ggttgaagcg ggcgatcgac gcgtcaccgg ccgggggtatt cgtcgacttc     1020
aaccctccg atatcagagc cggccggccc gcggtgacct atcgagaggt ccgcgccggg     1080
catcaggtgc ggtggacgat tctgctcgac ggagcgggtc ggatcagcgt cggctgccag     1140
agcgggcccc gccatgaaga cctcctcagg gaggtgtgtg cgcaagccgt acggtccgtc     1200
cacgccgttg gt                                         1212

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<210> 247

<211> 1236

<212> PRT

<213> *Mycobacterium tuberculosis*

-305-

<400> 247

Met Asn Ser Gly Pro Ala Cys Ala Thr Ala Asp Ile Leu Val Ala Pro
 1 5 10 15

Pro Pro Glu Leu Arg Arg Ser Glu Pro Ser Ser Leu Leu Ile Arg Leu
 20 25 30

Leu Pro Val Val Met Ser Val Ala Thr Val Gly Val Met Val Thr Val
 35 40 45

Phe Leu Pro Gly Ser Pro Ala Thr Arg His Pro Thr Phe Leu Ala Phe
 50 55 60

Pro Met Met Met Leu Val Ser Leu Val Val Thr Ala Val Thr Gly Arg
 65 70 75 80

Gly Arg Arg His Val Ser Gly Ile His Asn Asp Arg Val Asp Tyr Leu
 85 90 95

Gly Tyr Leu Ser Val Leu Arg Thr Ser Val Thr Gln Thr Ala Ala Ala
 100 105 110

Gln His Val Ser Leu Asn Trp Thr His Pro Asp Pro Ala Thr Leu Trp
 115 120 125

Thr Leu Ile Gly Gly Pro Arg Met Trp Glu Arg Arg Pro Gly Ala Ala
 130 135 140

Asp Phe Cys Arg Ile Arg Val Gly Val Gly Ser Ala Pro Leu Ala Thr
 145 150 155 160

Arg Leu Val Val Gly Gln Leu Pro Pro Ala Gln Arg Ala Asp Pro Val
 165 170 175

Thr Arg Ala Ala Leu Arg Cys Phe Leu Ala Ala His Ala Thr Ile Ala
 180 185 190

Asp Ala Pro Ile Ala Ile Pro Leu Arg Val Gly Gly Pro Ile Ala Ile
 195 200 205

Asp Gly Asp Pro Thr Lys Val Arg Gly Leu Leu Arg Ala Met Ile Cys
 210 215 220

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Gln Leu Ala Val Trp His Ser Pro Glu Glu Leu Leu Ile Ala Gly Val
 225 230 235 240

Val Ser Asp Arg Asn Arg Ala His Trp Asp Trp Leu Lys Trp Leu Pro
 245 250 255

His Asn Gln His Pro Asn Ala Cys Asp Ala Leu Gly Pro Ala Pro Met
 260 265 270

Val Tyr Ser Thr Leu Ala Glu Met Gln Asn Ala Leu Ala Ala Thr Val
 275 280 285

Leu Ala His Val Val Ala Ile Val Asp Thr Ala Glu Arg Gly Asn Gly
 290 295 300

Ala Ile Thr Gly Val Ile Thr Ile Glu Val Gly Ala Arg Arg Asp Gly
 305 310 315 320

Ala Pro Pro Val Val Arg Cys Ala Gly Glu Val Thr Ala Leu Ala Cys
 325 330 335

Pro Asp Gln Leu Glu Pro Gln Asp Ala Leu Val Cys Ala Arg Arg Leu
 340 345 350

Ala Ala His Arg Val Gly His Ser Gly Arg Thr Phe Ile Arg Gly Ser
 355 360 365

Gly Trp Ala Glu Leu Val Gly Ile Gly Asp Val Ala Ala Phe Asp Pro
 370 375 380

Ser Thr Leu Trp Arg Asn Val Asn Gln His Asp Arg Leu Arg Val Pro
 385 390 395 400

Ile Gly Val Thr Pro Asp Gly Thr Ala Val Gln Leu Asp Ile Lys Glu
 405 410 415

Ala Ala Glu Gln Gly Met Gly Pro His Gly Leu Cys Val Gly Ala Thr
 420 425 430

Gly Ser Gly Lys Ser Glu Leu Leu Arg Thr Ile Ala Leu Gly Met Met
 435 440 445

Ala Arg Asn Ser Pro Glu Val Leu Asn Leu Leu Leu Val Asp Phe Lys
 450 455 460

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Gly Gly Ala Thr Phe Leu Asp Leu Ala Gly Ala Pro His Val Ala Ala
 465 470 475 480

Val Ile Thr Asn Leu Ala Glu Glu Ala Pro Leu Val Ala Arg Met Gln
 485 490 495

Asp Ala Leu Ala Gly Glu Met Ser Arg Arg Gln Gln Leu Leu Arg Met
 500 505 510

Ala Gly His Leu Val Ser Val Thr Ala Tyr Gln Arg Ala Arg Gln Thr
 515 520 525

Gly Ala Gln Leu Pro Cys Leu Pro Ile Leu Phe Ile Val Val Asp Glu
 530 535 540

Phe Ser Glu Leu Leu Ser Gln His Pro Glu Phe Val Asp Val Phe Leu
 545 550 555 560

Ala Ile Gly Arg Val Gly Arg Ser Leu Gly Met His Leu Leu Leu Ala
 565 570 575

Ser Gln Arg Leu Asp Glu Gly Arg Leu Arg Gly Leu Glu Thr His Leu
 580 585 590

Ser Tyr Arg Met Cys Leu Lys Thr Trp Ser Ala Ser Glu Ser Arg Asn
 595 600 605

Val Leu Gly Thr Gln Asp Ala Tyr Gln Leu Pro Asn Thr Pro Gly Ala
 610 615 620

Gly Leu Leu Gln Thr Gly Thr Gly Glu Leu Ile Arg Phe Gln Thr Ala
 625 630 635 640

Phe Val Ser Gly Pro Leu Arg Arg Ala Ser Pro Ser Ala Val His Pro
 645 650 655

Val Ala Pro Pro Ser Val Arg Pro Phe Thr Thr His Ala Ala Ala Pro
 660 665 670

Val Thr Ala Gly Pro Val Gly Gly Thr Ala Glu Val Pro Thr Pro Thr
 675 680 685

Val Leu His Ala Val Leu Asp Arg Leu Val Gly His Gly Pro Ala Ala

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690						695						700					
His	Gln	Val	Trp	Leu	Pro	Pro	Leu	Asp	Glu	Pro	Pro	Met	Leu	Gly	Ala		
705					710					715					720		
Leu	Leu	Arg	Asp	Ala	Glu	Pro	Ala	Gln	Ala	Glu	Leu	Ala	Val	Pro	Ile		
				725					730					735			
Gly	Ile	Val	Asp	Arg	Pro	Phe	Glu	Gln	Ser	Arg	Val	Pro	Leu	Thr	Ile		
			740					745					750				
Asp	Leu	Ser	Gly	Ala	Ala	Gly	Asn	Val	Ala	Val	Val	Gly	Ala	Pro	Gln		
		755					760					765					
Thr	Gly	Lys	Ser	Thr	Ala	Leu	Arg	Thr	Leu	Ile	Met	Ala	Leu	Ala	Ala		
	770					775					780						
Thr	His	Asp	Ala	Gly	Arg	Val	Gln	Phe	Tyr	Cys	Leu	Asp	Phe	Gly	Gly		
785					790					795					800		
Gly	Ala	Leu	Ala	Gln	Val	Asp	Glu	Leu	Pro	His	Val	Gly	Ala	Val	Ala		
				805					810					815			
Gly	Arg	Ala	Gln	Pro	Gln	Leu	Ala	Ser	Arg	Met	Leu	Ala	Glu	Leu	Glu		
			820					825					830				
Ser	Ala	Val	Arg	Phe	Arg	Glu	Ala	Phe	Phe	Arg	Asp	His	Gly	Ile	Asp		
		835					840					845					
Ser	Val	Ala	Arg	Tyr	Arg	Gln	Leu	Arg	Ala	Lys	Ser	Ala	Ala	Glu	Ser		
		850				855					860						
Phe	Ala	Asp	Ile	Phe	Leu	Val	Ile	Asp	Gly	Trp	Ala	Ser	Leu	Arg	Gln		
865					870					875					880		
Glu	Phe	Ala	Ala	Leu	Glu	Glu	Ser	Ile	Val	Ala	Leu	Ala	Ala	Gln	Gly		
				885					890					895			
Leu	Ser	Phe	Gly	Val	His	Val	Ala	Leu	Ser	Ala	Ala	Arg	Trp	Ala	Glu		
			900					905					910				
Ile	Arg	Pro	Ser	Leu	Arg	Asp	Gln	Ile	Gly	Ser	Arg	Ile	Glu	Leu	Arg		
			915				920					925					

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Leu Ala Asp Pro Ala Asp Ser Glu Leu Asp Arg Arg Gln Ala Gln Arg
 930 935 940

Val Pro Val Asp Arg Pro Gly Arg Gly Leu Ser Arg Asp Gly Met His
 945 950 955 960

Met Val Ile Ala Leu Pro Asp Leu Asp Gly Val Ala Leu Arg Arg Arg
 965 970 975

Ser Gly Asp Pro Val Ala Pro Pro Ile Pro Leu Leu Pro Ala Arg Val
 980 985 990

Asp Tyr Asp Ser Val Val Ala Arg Ala Gly Asp Glu Leu Gly Ala His
 995 1000 1005

Ile Leu Leu Gly Leu Glu Glu Arg Arg Gly Gln Pro Val Ala Val
 1010 1015 1020

Asp Phe Gly Arg His Pro His Leu Leu Val Leu Gly Asp Asn Glu
 1025 1030 1035

Cys Gly Lys Thr Ala Ala Leu Arg Thr Leu Cys Arg Glu Ile Val
 1040 1045 1050

Arg Thr His Thr Ala Ala Arg Ala Gln Leu Leu Ile Val Asp Phe
 1055 1060 1065

Arg His Thr Leu Leu Asp Val Ile Glu Ser Glu His Met Ser Gly
 1070 1075 1080

Tyr Val Ser Ser Pro Ala Ala Leu Gly Ala Lys Leu Ser Ser Leu
 1085 1090 1095

Val Asp Leu Leu Gln Ala Arg Met Pro Ala Pro Asp Val Ser Gln
 1100 1105 1110

Ala Gln Leu Arg Ala Arg Ser Trp Trp Ser Gly Pro Asp Ile Tyr
 1115 1120 1125

Val Val Val Asp Asp Tyr Asp Leu Val Ala Val Ser Ser Gly Asn
 1130 1135 1140

Pro Leu Met Val Leu Leu Glu Tyr Leu Pro His Ala Arg Asp Leu
 1145 1150 1155

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Gly Leu His Leu Val Val Ala Arg Arg Ser Gly Gly Ala Ala Arg
 1160 1165 1170

Ala Leu Phe Glu Pro Val Leu Ala Ser Leu Arg Asp Leu Gly Cys
 1175 1180 1185

Arg Ala Leu Leu Met Ser Gly Arg Pro Asp Glu Gly Ala Leu Phe
 1190 1195 1200

Gly Ser Ser Arg Pro Met Pro Leu Pro Pro Gly Arg Gly Ile Leu
 1205 1210 1215

Val Thr Gly Ala Gly Asp Glu Gln Leu Val Gln Val Ala Trp Ser
 1220 1225 1230

Pro Pro Pro
 1235

<210> 248

<211> 3708

<212> DNA

<213> Mycobacterium tuberculosis

<400> 248

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cggcggtcgg aaccgtccag cctgctgatt cgctgtctcc cggtcgtcat gtcgggtggc	120
accgtgggtg tcatgggtgac ggtgttcttg ccgggctcgc cggccacgcg ccacccacg	180
tttctggcct tcccaatgat gatgctggtc tcgttggtgg tgactgcggt aaccggacgc	240
ggccggcggc atgtctccgg tatccacaac gaccgtgtcg actacctcgg gtacctgagt	300
gtcttgcgca catctgtcac ccaaacgggt gcagcacaac acgtatcact gaactggacg	360
catcccgatc ctgccacett gtggacattg atcgggtggc cgcgaatgtg ggagcgtcga	420
ccgggtgctg ccgacttctg tcgcatccgt gtcggagttg gatctgcacc gctggccacc	480
cgcttggtgg tcgggcagct tccgccggcg cagcgtgcgg atccggtcac ccgcgccgcg	540
ctgcgctgtt tccttgccgc acacgcgacc attgcggatg cgcccatcgc gatcccttg	600
cgggtcggcg gtccgatcgc catcgacggt gacccgacca aggtccgcgg gctgctgcgg	660

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gcgatgatct gccagctggc cgtatggcac tcaccggagg agttgctgat cgccggcgtg	720
gtcagtgaacc gcaaccgcgc gcaactgggat tggtgaaat ggctgccgca caaccaacat	780
ccgaatgcct gtgatgcctt gggggccagcc ccgatgggtg actcgaccct ggcagagatg	840
caaaatgcgc tagccgcaac ggtattggcc caggttggtg cgatcgtcga cagggccgaa	900
cgtggcaacg gcgcgatcac cggcgtgac acgatcgagg tgggcgccag acgagaacgt	960
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<210> 249

<211> 470

<212> PRT

<213> Mycobacterium tuberculosis

<400> 249

Val Pro Ser Pro Ala Thr Thr Trp Leu His Val Ser Gly Tyr Arg Phe

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1	5	10	15
Leu Leu Arg Arg Ile Glu Cys Ala Leu Leu Phe Gly Asp Val Cys Ala	20	25	30
Ala Thr Gly Ala Leu Arg Ala Arg Thr Thr Ser Leu Ala Leu Gly Cys	35	40	45
Val Leu Ala Ile Val Ala Ala Met Gly Cys Ala Phe Val Ala Leu Leu	50	55	60
Arg Pro Gln Ser Ala Leu Gly Gln Ala Pro Ile Val Met Gly Arg Glu	65	70	75
Ser Gly Ala Leu Tyr Val Arg Val Asp Asp Val Trp His Pro Val Leu	85	90	95
Asn Leu Ala Ser Ala Arg Leu Ile Ala Ala Thr Asn Ala Asn Pro Gln	100	105	110
Pro Val Ser Glu Ser Glu Leu Gly His Thr Lys Arg Gly Pro Leu Leu	115	120	125
Gly Ile Pro Gly Ala Pro Gln Leu Leu Asp Gln Pro Leu Ala Gly Ala	130	135	140
Glu Ser Ala Trp Ala Ile Cys Asp Ser Asp Asn Gly Gly Ser Thr Thr	145	150	155
Val Val Val Gly Pro Ala Glu Asp Ser Ser Ala Gln Val Leu Thr Ala	165	170	175
Glu Gln Met Ile Leu Val Ala Thr Glu Ser Gly Ser Pro Thr Tyr Leu	180	185	190
Leu Tyr Gly Gly Arg Arg Ala Val Val Asp Leu Ala Asp Pro Ala Val	195	200	205
Val Trp Ala Leu Arg Leu Gln Gly Arg Val Pro His Val Val Ala Gln	210	215	220
Ser Leu Leu Asn Ala Val Pro Glu Ala Pro Arg Ile Thr Ala Pro Arg	225	230	235
			240

Ile Arg Gly Gly Gly Arg Ala Ser Val Gly Leu Pro Gly Phe Leu Val
245 250 255

Gly Gly Val Val Arg Ile Thr Arg Ala Ser Gly Asp Glu Tyr Tyr Val
260 265 270

Val Leu Glu Asp Gly Val Gln Arg Ile Gly Gln Val Ala Ala Asp Leu
275 . 280 285

Leu Arg Phe Gly Asp Ser Gln Gly Ser Val Asn Val Pro Thr Val Ala
290 295 300

Pro Asp Val Ile Arg Val Ala Pro Ile Val Asn Thr Leu Pro Val Ser
305 310 315 320

Ala Phe Pro Asp Arg Pro Pro Thr Pro Val Asp Gly Ser Pro Gly Arg
325 330 335

Ala Val Thr Thr Leu Cys Val Thr Trp Thr Pro Ala Gln Pro Gly Ala
 . 340 345 350

Ala Arg Val Ala Phe Leu Ala Gly Ser Gly Pro Pro Val Pro Leu Gly
355 360 365

Gly Val Pro Val Thr Leu Ala Gln Ala Asp Gly Arg Gly Pro Ala Leu
370 375 380

Asp Ala Val Tyr Leu Pro Pro Gly Arg Ser Ala Tyr Val Ala Ala Arg
385 390 395 400

Ser Leu Ser Gly Gly Gly Thr Gly Thr Arg Tyr Leu Val Thr Asp Thr
405 410 415

Gly Val Arg Phe Ala Ile His Asp Asp Asp Val Ala His Asp Leu Gly
420 425 430

Leu Pro Thr Ala Ala Ile Pro Ala Pro Trp Pro Val Leu Ala Thr Leu
435 440 445

Pro Ser Gly Pro Glu Leu Ser Arg Ala Asn Ala Ser Val Ala Arg Asp
450 455 460

Thr Val Ala Pro Gly Pro
465 470

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<210> 250

<211> 1410

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 250

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acaacatcgc tggccctcgg gtgcgtgctg gcgatcgtcg ccgcgatggg atgcgcattc      180
gttgcgctgc tgcggccaca gtcggcgctc ggtcaggcgc cgatcgtgat gggtcgggaa      240
tccggggcac tctacgtgcg agtggacgat gtctggcatc cgggtgttga cctggcttcg      300
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ctggtggcga ccgaatcagg ttcgcccacc tacctgctct acggcggtcg gcgggcccgtg      600
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attcgtggcg gcgggcgggc ctcggtcggg ctgcccgggt ttctggtcgg cgggtgtggtg      780
cgcatcactc gcgcgagcgg tgatgagtat tacgtggtgc tggaggacgg cgtgcagcgc      840
atcggccagg tcgccgcgga tttgttgctg ttcggcgatt cgcagggcag cgtcaacgtc      900
ccgacgggtg ccccgatgt gattcgcgtc gtcctgatcg tgaacacctt gccggtgtcg      960
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ccgtggccgg tgttggcgac actgccgtcc ggaccggagc tgagtagagc caacgcgtca     1380
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gtcgcccgcg ataccgttgc gcccgggccg

1410

<210> 251

<211> 317

<212> PRT

<213> Mycobacterium tuberculosis

<400> 251

Val Ser Thr Arg Gln Ala Ala Glu Ala Asp Leu Ala Gly Lys Ala Ala
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Gln Tyr Arg Pro Asp Glu Leu Ala Arg Tyr Ala Gln Arg Val Met Asp
 20 25 30

Trp Leu His Pro Asp Gly Asp Leu Thr Asp Thr Glu Arg Ala Arg Lys
 35 40 45

Arg Gly Ile Thr Leu Ser Asn Gln Gln Tyr Asp Gly Met Ser Arg Leu
 50 55 60

Ser Gly Tyr Leu Thr Pro Gln Ala Arg Ala Thr Phe Glu Ala Val Leu
 65 70 75 80

Ala Lys Leu Ala Ala Pro Gly Ala Thr Asn Pro Asp Asp His Thr Pro
 85 90 95

Val Ile Asp Thr Thr Pro Asp Ala Ala Ala Ile Asp Arg Asp Thr Arg
 100 105 110

Ser Gln Ala Gln Arg Asn His Asp Gly Leu Leu Ala Gly Leu Arg Ala
 115 120 125

Leu Ile Ala Ser Gly Lys Leu Gly Gln His Asn Gly Leu Pro Val Ser
 130 135 140

Ile Val Val Thr Thr Thr Leu Thr Asp Leu Gln Thr Gly Ala Gly Lys
 145 150 155 160

Gly Phe Thr Gly Gly Gly Thr Leu Leu Pro Met Ala Asp Val Ile Arg
 165 170 175

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Met Thr Ser His Ala His His Tyr Ser Pro Ala Ser Gly Arg Tyr Pro
 180 185 190

Gln Ala Ile Phe Asp His Gly Thr Pro Leu Ala Leu Tyr His Thr Lys
 195 200 205

Arg Leu Ala Ser Pro Ala Gln Arg Ile Met Leu Phe Ala Asn Asp Arg
 210 215 220

Gly Cys Thr Lys Pro Gly Cys Asp Ala Pro Ala Tyr His Ser Gln Ala
 225 230 235 240

His His Val Thr Ala Trp Thr Ser Thr Gly Arg Thr Asp Ile Thr Glu
 245 250 255

Leu Thr Leu Ala Cys Gly Pro Asp Asn Arg Leu Ala Glu Lys Gly Trp
 260 265 270

Thr Thr His Asn Asn Thr His Gly His Thr Glu Trp Leu Pro Pro Pro
 275 280 285

His Leu Asp His Gly Gln Pro Arg Thr Asn Thr Phe His His Pro Glu
 290 295 300

Arg Phe Leu His Asn Gln Asp Asp Asp Lys Pro Asp
 305 310 315

<210> 252

<211> 951

<212> DNA

<213> Mycobacterium tuberculosis

<400> 252
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 gccaaactgg ccgcccccg cgcgaccaac cccgacgacc acaccccggt catcgacacc 300
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gggctgctgg ccgggctgcg cgcgctgac gcctccggga aactggggcca acacaacggt 420
 cttcccgtct cgatcgtggt caccaccacc ctgaccgacc tgcaaaccgg cgccggcaag 480
 ggcttcaccg gcggcggcac cctgctaccc atggccgatg tgatccgcat gaccagccac 540
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 gccaacgacc gcggctgcac caaaccggc tgtgacgcac cggcctacca cagccaagcc 720
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 cacaccgaat ggctaccacc accccacctc gaccacggcc aaccccgac caacaccttc 900
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<210> 253

<211> 373

<212> PRT

<213> Mycobacterium tuberculosis .

<400> 253

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Asp Thr Ile Val Asp Ala Val Cys Thr Pro Glu His Gln Arg Glu Leu
 20 25 30

Asp Lys Leu Glu Gln Arg Phe Asp Arg Glu Leu Trp Arg Lys Leu Ile
 35 40 45

Asp Ala Gly Ile Leu Ser Ser Ala Ala Pro Glu Ser Leu Gly Gly Asp
 50 55 60

Gly Phe Gly Val Leu Glu Gln Val Ala Val Leu Val Ala Leu Gly His
 65 70 75 80

Gln Leu Ala Ala Val Pro Tyr Leu Glu Ser Val Val Leu Ala Ala Gly
 85 90 95

Ala Leu Ala Arg Phe Gly Ser Pro Glu Leu Gln Gln Gly Trp Gly Val

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100	105	110
Ser Ala Val Ser Gly Asp Arg Ile Leu Thr Val Ala Leu Asp Gly Glu 115 120 125		
Met Gly Glu Gly Pro Val Gln Ala Ala Gly Thr Gly His Gly Tyr Arg 130 135 140		
Leu Thr Gly Thr Arg Thr Gln Val Gly Tyr Gly Pro Val Ala Asp Ala 145 150 155 160		
Phe Leu Val Pro Ala Glu Thr Asp Ser Gly Ala Ala Val Phe Leu Val 165 170 175		
Ala Ala Gly Asp Pro Gly Val Ala Val Thr Ala Leu Ala Thr Thr Gly 180 185 190		
Leu Gly Ser Val Gly His Leu Glu Leu Asn Gly Ala Lys Val Asp Ala 195 200 205		
Ala Arg Arg Val Gly Gly Thr Asp Val Ala Val Trp Leu Gly Thr Leu 210 215 220		
Ser Thr Leu Ser Arg Thr Ala Phe Gln Leu Gly Val Leu Glu Arg Gly 225 230 235 240		
Leu Gln Met Thr Ala Glu Tyr Ala Arg Thr Arg Glu Gln Phe Asp Arg 245 250 255		
Pro Ile Gly Ser Phe Gln Ala Val Gly Gln Arg Leu Ala Asp Gly Tyr 260 265 270		
Ile Asp Val Lys Gly Leu Arg Leu Thr Leu Thr Gln Ala Ala Trp Arg 275 280 285		
Val Ala Glu Asp Ser Leu Ala Ser Arg Glu Cys Pro Gln Pro Ala Asp 290 295 300		
Ile Asp Val Ala Thr Ala Gly Phe Trp Ala Ala Glu Ala Gly His Arg 305 310 315 320		
Val Ala His Thr Ile Val His Val His Gly Gly Val Gly Val Asp Thr 325 330 335		

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Asp His Pro Val His Arg Tyr Phe Leu Ala Ala Lys Gln Thr Glu Phe
 340 345 350

Ala Leu Gly Gly Ala Thr Gly Gln Leu Arg Arg Ile Gly Arg Glu Leu
 355 360 365

Ala Glu Thr Pro Ala
 370

<210> 254

<211> 1119

<212> DNA

<213> Mycobacterium tuberculosis

<400> 254

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caactggccg cggtgccgta cctggagtgc gtggtgctgc ccgccggcgc cctggcccgc	300
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ctccgccgaa tcggccgtga actggcggaa acccctgcc

1119

<210> 255

<211> 386

<212> PRT

<213> Mycobacterium tuberculosis

<400> 255

Val	Leu	Ser	Gly	Gln	Ala	Ala	Ile	Val	Gly	Ile	Gly	Ala	Thr	Asp	Phe
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Ser	Lys	Asn	Ser	Gly	Arg	Ser	Glu	Leu	Arg	Leu	Ala	Ala	Glu	Ala	Val
			20					25					30		

Leu	Asp	Ala	Leu	Ala	Asp	Ala	Gly	Leu	Ser	Pro	Thr	Asp	Val	Asp	Gly
		35					40					45			

Leu	Thr	Thr	Phe	Thr	Met	Asp	Thr	Asn	Thr	Glu	Ile	Ala	Val	Ala	Arg
	50					55					60				

Ala	Ala	Gly	Ile	Gly	Glu	Leu	Thr	Phe	Phe	Ser	Lys	Ile	His	Tyr	Gly
65					70					75					80

Gly	Gly	Ala	Ala	Cys	Ala	Thr	Val	Gln	His	Ala	Ala	Met	Ala	Val	Ala
				85					90					95	

Thr	Gly	Val	Ala	Asp	Val	Val	Val	Ala	Tyr	Arg	Ala	Phe	Asn	Glu	Arg
			100					105					110		

Ser	Gly	Met	Arg	Phe	Gly	Gln	Val	Gln	Thr	Arg	Leu	Thr	Glu	Asn	Ala
		115					120					125			

Asp	Ser	Thr	Gly	Val	Asp	Asn	Ser	Phe	Ser	Tyr	Pro	His	Gly	Leu	Ser
		130				135					140				

Thr	Pro	Ala	Ala	Gln	Val	Ala	Met	Ile	Ala	Arg	Arg	Tyr	Met	His	Leu
145					150					155					160

Ser	Gly	Ala	Thr	Ser	Arg	Asp	Phe	Gly	Ala	Val	Ser	Val	Ala	Asp	Arg
				165					170					175	

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Lys His Ala Ala Asn Asn Pro Lys Ala Tyr Phe Tyr Gly Lys Pro Ile
 180 185 190

Thr Ile Glu Asp His Gln Asn Ser Arg Trp Ile Ala Glu Pro Leu Arg
 195 200 205

Leu Leu Asp Cys Cys Gln Glu Thr Asp Gly Ala Val Ala Ile Val Val
 210 215 220

Thr Ser Ala Ala Arg Ala Arg Asp Leu Lys Gln Arg Pro Val Val Ile
 225 230 235 240

Glu Ala Ala Ala Gln Gly Cys Ser Pro Asp Gln Tyr Thr Met Val Ser
 245 250 255

Tyr Tyr Arg Pro Glu Leu Asp Gly Leu Pro Glu Met Gly Leu Val Gly
 260 265 270

Arg Gln Leu Trp Ala Gln Ser Gly Leu Thr Pro Ala Asp Val Gln Thr
 275 280 285

Ala Val Leu Tyr Asp His Phe Thr Pro Phe Thr Leu Ile Gln Leu Glu
 290 295 300

Glu Leu Gly Phe Cys Gly Lys Gly Glu Ala Lys Asp Phe Ile Ala Asp
 305 310 315 320

Gly Ala Ile Glu Val Gly Gly Arg Leu Pro Ile Asn Thr His Gly Gly
 325 330 335

Gln Leu Gly Glu Ala Tyr Ile His Gly Met Asn Gly Ile Ala Glu Gly
 340 345 350

Val Arg Gln Leu Arg Gly Thr Ser Val Asn Pro Val Ala Gly Val Glu
 355 360 365

His Val Leu Val Thr Ala Gly Thr Gly Val Pro Thr Ser Gly Leu Ile
 370 375 380

Leu Gly
 385

<210> 256

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<211> 1158

<212> DNA

<213> Mycobacterium tuberculosis

<400> 256

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<210> 257

<211> 391

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 257

Met Gly Tyr Pro Val Ile Val Glu Ala Thr Arg Ser Pro Ile Gly Lys
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Arg Asn Gly Trp Leu Ser Gly Leu His Ala Thr Glu Leu Leu Gly Ala
 20 25 30

Val Gln Lys Ala Val Val Asp Lys Ala Gly Ile Gln Ser Gly Leu His
 35 40 45

Ala Gly Asp Val Glu Gln Val Ile Gly Gly Cys Val Thr Gln Phe Gly
 50 55 60

Glu Gln Ser Asn Asn Ile Ser Arg Val Ala Trp Leu Thr Ala Gly Leu
 65 70 75 80

Pro Glu His Val Gly Ala Thr Thr Val Asp Cys Gln Cys Gly Ser Gly
 85 90 95

Gln Gln Ala Asn His Leu Ile Ala Gly Leu Ile Ala Ala Gly Ala Ile
 100 105 110

Asp Val Gly Ile Ala Cys Gly Ile Glu Ala Met Ser Arg Val Gly Leu
 115 120 125

Gly Ala Asn Ala Gly Pro Asp Arg Ser Leu Ile Arg Ala Gln Ser Trp
 130 135 140

Asp Ile Asp Leu Pro Asn Gln Phe Glu Ala Ala Glu Arg Ile Ala Lys
 145 150 155 160

Arg Arg Gly Ile Thr Arg Glu Asp Val Asp Val Phe Gly Leu Glu Ser
 165 170 175

Gln Arg Arg Ala Gln Arg Ala Trp Ala Glu Gly Arg Phe Asp Arg Glu
 180 185 190

Ile Ser Pro Ile Gln Ala Pro Val Leu Asp Glu Gln Asn Gln Pro Thr
 195 200 205

Gly Glu Arg Arg Leu Val Phe Arg Asp Gln Gly Leu Arg Glu Thr Thr
 210 215 220

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Met Ala Gly Leu Gly Glu Leu Lys Pro Val Leu Glu Gly Gly Ile His
 225 230 235 240

Thr Ala Gly Thr Ser Ser Gln Ile Ser Asp Gly Ala Ala Ala Val Leu
 245 250 255

Trp Met Asp Glu Ala Val Ala Arg Ala His Gly Leu Thr Pro Arg Ala
 260 265 270

Arg Ile Val Ala Gln Ala Leu Val Gly Ala Glu Pro Tyr Tyr His Leu
 275 280 285

Asp Gly Pro Val Gln Ser Thr Ala Lys Val Leu Glu Lys Ala Gly Met
 290 295 300

Lys Ile Gly Asp Ile Asp Ile Val Glu Ile Asn Glu Ala Phe Ala Ser
 305 310 315 320

Val Val Leu Ser Trp Ala Arg Val His Glu Pro Asp Met Asp Arg Val
 325 330 335

Asn Val Asn Gly Gly Ala Ile Ala Leu Gly His Pro Val Gly Cys Thr
 340 345 350

Gly Ser Arg Leu Ile Thr Thr Ala Leu His Glu Leu Glu Arg Thr Asp
 355 360 365

Gln Ser Leu Ala Leu Ile Thr Met Cys Ala Gly Gly Ala Leu Ser Thr
 370 375 380

Gly Thr Ile Ile Glu Arg Ile
 385 390

<210> 258

<211> 1173

<212> DNA

<213> Mycobacterium tuberculosis

<400> 258
 atgggttacc cggatcatcgt tgaagccacc cgcagcccca tcggcaaacg caacggatgg 60

ctgtcggggc tgcattgccac cgagttgttg ggcgcggtgc aaaaggcggg ggtcgacaag 120

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gccggcatcc agtccggcct tcacgccggg gacgtcgaac aggtcatcgg cggttgcgtg 180
 acccagttcg gggagcaatc caacaacatc agccgggtgg cctggctgac ggccggtttg 240
 cccgaacacg tcggcgccac caccgtcgac tgccagtgcg gcagcggcca gcaggccaac 300
 catctgattg ccgggttgat cgcggccggg gccatcgatg tcggcatcgc ctgcggcatc 360
 gaggcgatga gccgggtcgg gctggggcgc aacgccgggc cggaccgctc gctgatccgc 420
 gcgcagtcac gggatatcga cctgccgaac cagttcgagg ccgccgagcg gatcgccaag 480
 cggcgcgcca tcacccgcga ggacgtggat gtcttcgggc tcgagtcgca gcgacgcgcg 540
 cagcgggcct gggcggaggg ccgctttgac cgcgagatct cgccgatcca ggcgccggtg 600
 ctcgacgagc agaatcagcc caccggcgag cggcgccctgg tctttcgca ccagggcctg 660
 cgcgagacca cgatggcggg gctaggcgag ctgaaaccgg tgctcgaggg cggcatccac 720
 accgcgggca cgtcgtcgca gatctccgac ggcgcggcag ccgtgttggt gatggacgaa 780
 gccgtggcac gtgcgcacgg cctgaccccg cgggcccggg tcgtcgcca ggcactcgtc 840
 ggcgcgagc cctactacca cctggacggc ccggtgcagt ccaccgcga ggtgctggag 900
 aaggccggca tgaagatcgg cgacatcgac atcgtcgaga tcaacgaggc gttcgcgtcc 960
 gtggtgctgt cctgggcgcg ggtgcacgag cccgacatgg accgggtcaa cgtcaacggc 1020
 ggggcgatcg cgctggggca tccggtgggc tgcaccggca gccggctgat caccaccgcc 1080
 ctgcacgagc tcgagcgcac cgaccagagc ctgcgcgtga tcaccatgtg cgccggcggg 1140
 gccctgtcca ccggcaccat catcgagcgg att 1173

<210> 259

<211> 247

<212> PRT

<213> Mycobacterium tuberculosis

<400> 259

Met Pro Ile Thr Ser Thr Thr Pro Glu Pro Gly Ile Val Ala Val Thr
 1 5 10 15

Val Asp Tyr Pro Pro Val Asn Ala Ile Pro Ser Lys Ala Trp Phe Asp
 20 25 30

Leu Ala Asp Ala Val Thr Ala Ala Gly Ala Asn Ser Asp Thr Arg Ala

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35

40

45

Val Ile Leu Arg Ala Glu Gly Arg Gly Phe Asn Ala Gly Val Asp Ile
 50 55 60

Lys Glu Met Gln Arg Thr Glu Gly Phe Thr Ala Leu Ile Asp Ala Asn
 65 70 75 80

Arg Gly Cys Phe Ala Ala Phe Arg Ala Val Tyr Glu Cys Ala Val Pro
 85 90 95

Val Ile Ala Ala Val Asn Gly Phe Cys Val Gly Gly Gly Ile Gly Leu
 100 105 110

Val Gly Asn Ser Asp Val Ile Val Ala Ser Glu Asp Ala Thr Phe Gly
 115 120 125

Leu Pro Glu Val Glu Arg Gly Ala Leu Gly Ala Ala Thr His Leu Ser
 130 135 140

Arg Leu Val Pro Gln His Leu Met Arg Arg Leu Phe Phe Thr Ala Ala
 145 150 155 160

Thr Val Asp Ala Ala Thr Leu Gln His Phe Gly Ser Val His Glu Val
 165 170 175

Val Ser Arg Asp Gln Leu Asp Glu Ala Ala Leu Arg Val Ala Arg Asp
 180 185 190

Ile Ala Ala Lys Asp Thr Arg Val Ile Arg Ala Ala Lys Glu Ala Leu
 195 200 205

Asn Phe Ile Asp Val Gln Arg Val Asn Ala Ser Tyr Arg Met Glu Gln
 210 215 220

Gly Phe Thr Phe Glu Leu Asn Leu Ala Gly Val Ala Asp Glu His Arg
 225 230 235 240

Asp Ala Phe Val Lys Lys Ser
 245

<210> 260

<211> 741

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<212> DNA

<213> Mycobacterium tuberculosis

<400> 260

```

atgccgatca cctccaccac gcccgaaaccg ggcatcgctcg cggtcaccgt cgactaccog      60
ccgggtcaacg ccatcccgtc gaaagcgtagg ttcgacctgg ccgacgcggg gacggccggcg      120
ggcgccaact ccgacacccg cgcggtagtc ctgcggggccg aggggcgcgg cttcaacgcc      180
gggggtggaca tcaaagagat gcaacgaacc gaaggtttca cggcgctgat cgacgccaac      240
cgcggctgct tcgccgcatt ccgcgccgtc tacgagtgcg cggcgccggg gatcgccgcc      300
gtgaacggat tctgcgtggg cggcggcacg gccctggtag gcaactccga cgtcatcgtg      360
gcctccgagg acgccacctt cggcctgccc gaggtggaac ggggcgcgct gggcgcggcc      420
acgcacctct cgcggctggg gcccagcac ctgatgcgac ggctgttctt tacggcggcc      480
accgtggacg cggccacctt gcagcacttc ggctcggtag acgaggtggg gtcccgcgat      540
cagctggacg aggccgcttt gcgggtggcc cgcgacatcg ccgccaaga caccgggtc      600
atccgcgccg ccaaggaggc gctgaacttc atcgacgtgc aacgggtcaa tgcgagttac      660
cggatggagc aaggttttac cttcgagctc aacctcgccg gagtcgccga cgagcacgcg      720
gacgcctttg tgaagaagtc a                                     741

```

<210> 261

<211> 250

<212> PRT

<213> Mycobacterium tuberculosis

<400> 261

```

Val Ser Thr Arg Ala Glu Val Cys Ala Val Ala Cys Ala Glu Leu Phe
1           5           10          15

Arg Asp Ala Gly Glu Ile Met Ile Ser Pro Met Thr Asn Met Ala Ser
          20          25          30

Val Gly Ala Arg Leu Ala Arg Leu Thr Phe Ala Pro Asp Ile Leu Leu
          35          40          45

```


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Thr Asp Gly Glu Ala Gln Leu Leu Ala Asp Thr Pro Ala Leu Gly Lys
 50 55 60

Thr Gly Ala Pro Asn Arg Ile Glu Gly Trp Met Pro Phe Gly Arg Val
 65 70 75 80

Phe Glu Thr Leu Ala Trp Gly Arg Arg His Val Val Met Gly Ala Asn
 85 90 95

Gln Val Asp Arg Tyr Gly Asn Gln Asn Ile Ser Ala Phe Gly Pro Leu
 100 105 110

Gln Arg Pro Thr Arg Gln Met Phe Gly Val Arg Gly Ser Pro Gly Asn
 115 120 125

Thr Ile Asn His Ala Thr Ser Tyr Trp Val Gly Asn His Cys Lys Arg
 130 135 140

Val Phe Val Glu Ala Val Asp Val Val Ser Gly Ile Gly Tyr Asp Lys
 145 150 155 160

Val Asp Pro Asp Asn Pro Ala Phe Arg Phe Val Asn Val Tyr Arg Val
 165 170 175

Val Ser Asn Leu Gly Val Phe Asp Phe Gly Gly Pro Asp His Ser Met
 180 185 190

Arg Ala Val Ser Leu His Pro Gly Val Thr Pro Gly Asp Val Arg Asp
 195 200 205

Ala Thr Ser Phe Glu Val His Asp Leu Asp Ala Ala Glu Gln Thr Arg
 210 215 220

Leu Pro Thr Asp Asp Glu Leu His Leu Ile Arg Ala Val Ile Asp Pro
 225 230 235 240

Lys Ser Leu Arg Asp Arg Glu Ile Arg Ser
 245 250

<210> 262

<211> 750

<212> DNA

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<213> *Mycobacterium tuberculosis*

<400> 262

```

gtgagcaccg gagccgaagt gtgtgccgtc gcctgcgccg agttgttccg cgatgcaggc      60
gaaatcatga tcagcccatg gaccaacatg gcctcggttag gggcgcggtc ggcgcggctc     120
accttcgcgc cggacattct gctgaccgac ggcgaggctc agctgctcgc ggacacaccg     180
gcattgggca agacgggcgc cccaaacagg attgaggggt ggatgccgtt cggccggggt      240
ttcgaaaccc tggcctgggg gcgcggcac gtggtgatgg gcgccaatca ggtcgaccgc      300
tatggcaatc agaacatctc ggcgttcggg ccgctgcagc ggccgaccgc gcagatgttc      360
ggcgtccgcg gctcgccggg caacaccatc aaccacgcca ccagttactg ggtgggcaac      420
cactgcaagc gggctcttct cgaggccgtc gatgtggtct ccggcatcgg ctacgacaag      480
gtggatccgg acaatccggc cttccgggtc gtcaacgtct accgggtggt gtccaacctc      540
ggcgtgttcg acttcggcgc ccccgaccac tccatgcggg cggtatccct acaccccggg      600
gtgacgcccg gcgacgtccg cgacgccacc tcgttcgagg tgcacgacct cgacgcggcc      660
gagcagacca ggctgcccac cgacgacgaa ctgcacctga tccgcgcggt aatcgatccg      720
aagtcgttgc gggacagggg gatacgatca                                     750

```

<210> 263

<211> 388

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 263

```

Val Thr Asp Arg Val Ala Leu Arg Ala Gly Val Pro Pro Phe Tyr Val
1           5           10           15

```

```

Met Asp Val Trp Leu Ala Ala Ala Glu Arg Gln Arg Thr His Gly Asp
20           25           30

```

```

Leu Val Asn Leu Ser Ala Gly Gln Pro Ser Ala Gly Ala Pro Glu Pro
35           40           45

```

```

Val Arg Ala Ala Ala Ala Ala Leu His Leu Asn Gln Leu Gly Tyr
50           55           60

```

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Ser Val Ala Leu Gly Ile Pro Glu Leu Arg Asp Ala Ile Ala Ala Asp
65 70 75 80

Tyr Gln Arg Arg His Gly Ile Thr Val Glu Pro Asp Ala Val Val Ile
85 90 95

Thr Thr Gly Ser Ser Gly Gly Phe Leu Leu Ala Phe Leu Ala Cys Phe
100 105 110

Asp Ala Gly Asp Arg Val Ala Met Ala Ser Pro Gly Tyr Pro Cys Tyr
115 120 125

Arg Asn Ile Leu Ser Ala Leu Gly Cys Glu Val Val Glu Ile Pro Cys
130 135 140

Gly Pro Gln Thr Arg Phe Gln Pro Thr Ala Gln Met Leu Ala Glu Ile
145 150 155 160

Asp Pro Pro Leu Arg Gly Val Val Val Ala Ser Pro Ala Asn Pro Thr
165 170 175

Gly Thr Val Ile Pro Pro Glu Glu Leu Ala Ala Ile Ala Ser Trp Cys
180 185 190

Asp Ala Ser Asp Val Arg Leu Ile Ser Asp Glu Val Tyr His Gly Leu
195 200 205

Val Tyr Gln Gly Ala Pro Gln Thr Ser Cys Ala Trp Gln Thr Ser Arg
210 215 220

Asn Ala Val Val Val Asn Ser Phe Ser Lys Tyr Tyr Ala Met Thr Gly
225 230 235 240

Trp Arg Leu Gly Trp Leu Leu Val Pro Thr Val Leu Arg Arg Ala Val
245 250 255

Asp Cys Leu Thr Gly Asn Phe Thr Ile Cys Pro Pro Val Leu Ser Gln
260 265 270

Ile Ala Ala Val Ser Ala Phe Thr Pro Glu Ala Thr Ala Glu Ala Asp
275 280 285

Gly Asn Leu Ala Ser Tyr Ala Ile Asn Arg Ser Leu Leu Leu Asp Gly

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290 295 300
 Leu Arg Arg Ile Gly Ile Asp Arg Leu Ala Pro Thr Asp Gly Ala Phe
 305 310 315 320
 Tyr Val Tyr Ala Asp Val Ser Asp Phe Thr Ser Asp Ser Leu Ala Phe
 325 330 335
 Cys Ser Lys Leu Leu Ala Asp Thr Gly Val Ala Ile Ala Pro Gly Ile
 340 345 350
 Asp Phe Asp Thr Ala Arg Gly Gly Ser Phe Val Arg Ile Ser Phe Ala
 355 360 365
 Gly Pro Ser Gly Asp Ile Glu Glu Ala Leu Arg Arg Ile Gly Ser Trp
 370 375 380
 Leu Pro Ser Gln
 385

<210> 264

<211> 1164

<212> DNA

<213> Mycobacterium tuberculosis

<400> 264

gtgacggatc gtgtcgccct gcgtgccggc gttccccctg tctacgtgat ggacgtcttg 60
 ttggcggccg cggagcgcca gcgcacccat ggggatcttg tgaatctttc ggccgggcca 120
 ccagtgccg gcgctccgga accggtgcgt gcggccgcgg ccgccgccct gcatctcaac 180
 cagttgggat actcgggtggc gctgggtatt ccggagctgc gcgacgctat ccgccgggat 240
 taccaacgcc ggcattggcat caccgtcgaa ccgatgcgg tggatgacac cacgggctcc 300
 tcgggaggct ttctgctcgc gtttctggcg tgcttcgacg ccggtgatcg ggtcgcgatg 360
 gccagtcccg gctaccctg ctaccggaat atcctgtcag cgctgggatg tgaggtcgtg 420
 gagatcccg gcggaccgca gaccgatc caaccgaccg cgcagatgct ggccgagatc 480
 gaccacgc tgccgggtgt cgtcgtcgcc agcccgcca acccgaccgg aaccgtcatc 540
 ccgccgaag aactggcggc catcgctcg tgggtgtgac catcggtatg ccggttgatc 600

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```

agtgatgagg tctaccaagg cctgggtgtac cagggggcac cgcaaaccag ctgcgcttgg      660
cagacgtcgc gaaacgcggg ggtagtcaac agctttttcca agtattacgc gatgacgggc      720
tggcggctgg gctgggtgct ggtgccgacg gtgctgcgcc gcgcggtgga ctgcctgacc      780
ggcaacttca ccatctgccc gccgggtcttg tcgcagatcg ccgcggtgtc cgcgttcacc      840
ccggaggcga ccgccgaggg cgacggcaac ctggccagct acgcgatcaa ccgctcgtg      900
ttgtgggacg gtctgcgtcg catcgccatc gaccggctgg caccaccga cggcgcattc      960
tacgtctacg ccgacgtctc ggacttcacc agcgattcgc tggccttctg ctcaaagtgt     1020
ctggccgaca ccggtgttgc gatcgcaccc ggaatcgatt tcgacaccgc acgggggggt     1080
tcgtttgttc ggatatcggt tgccggggcca agcggcgaca tcgaagaagc cttacggcgc     1140
atcggtcctt ggctgccgag ccaa                                             1164

```

<210> 265

<211> 291

<212> PRT

<213> Mycobacterium tuberculosis

<400> 265

```

Met Thr Ala Thr Glu Glu Leu Thr Phe Glu Ser Thr Ser Arg Phe Ala
1           5           10           15

```

```

Glu Val Asp Val Asp Gly Pro Leu Lys Leu His Tyr His Glu Ala Gly
20           25           30

```

```

Val Gly Asn Asp Gln Thr Val Val Leu Leu His Gly Gly Gly Pro Gly
35           40           45

```

```

Ala Ala Ser Trp Thr Asn Phe Ser Arg Asn Ile Ala Val Leu Ala Arg
50           55           60

```

```

His Phe His Val Leu Ala Val Asp Gln Pro Gly Tyr Gly His Ser Asp
65           70           75           80

```

```

Lys Arg Ala Glu His Gly Gln Phe Asn Arg Tyr Ala Ala Met Ala Leu
85           90           95

```

```

Lys Gly Leu Phe Asp Gln Leu Gly Leu Gly Arg Val Pro Leu Val Gly

```

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100	105	110
Asn Ser Leu Gly Gly Gly Thr Ala Val Arg Phe Ala Leu Asp Tyr Pro		
115	120	125
Ala Arg Ala Gly Arg Leu Val Leu Met Gly Pro Gly Gly Leu Ser Ile		
130	135	140
Asn Leu Phe Ala Pro Asp Pro Thr Glu Gly Val Lys Arg Leu Ser Lys		
145	150	155
		160
Phe Ser Val Ala Pro Thr Arg Glu Asn Leu Glu Ala Phe Leu Arg Val		
165	170	175
Met Val Tyr Asp Lys Asn Leu Ile Thr Pro Glu Leu Val Asp Gln Arg		
180	185	190
Phe Ala Leu Ala Ser Thr Pro Glu Ser Leu Thr Ala Thr Arg Ala Met		
195	200	205
Gly Lys Ser Phe Ala Gly Ala Asp Phe Glu Ala Gly Met Met Trp Arg		
210	215	220
Glu Val Tyr Arg Leu Arg Gln Pro Val Leu Leu Ile Trp Gly Arg Glu		
225	230	235
		240
Asp Arg Val Asn Pro Leu Asp Gly Ala Leu Val Ala Leu Lys Thr Ile		
245	250	255
Pro Arg Ala Gln Leu His Val Phe Gly Gln Cys Gly His Trp Val Gln		
260	265	270
Val Glu Lys Phe Asp Glu Phe Asn Lys Leu Thr Ile Glu Phe Leu Gly		
275	280	285
Gly Gly Arg		
290		
<210> 266		
<211> 873		
<212> DNA		
<213> Mycobacterium tuberculosis		

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<400> 266
 atgacagcta ccgaggaatt gacgttcgaa tccacctcgc gctttgcgga agtggacgtc 60
 gacggggccgc tgaaactgca ctaccacgag gccggcggtg gcaacgacca gacgggtggtg 120
 ctactgcacg gcggtggggc cggcgcgggc agctggacga acttctcgcg taatatcgcg 180
 gtgctggcgc ggcactttca tgtgctggcc gtcgaccagc ccggttacgg ccattccgac 240
 aagcggggccg agcacggcca gttcaatcgc tatgccgcga tggcgctgaa ggggctcttc 300
 gatcagctgg ggctggggcg ggtaccgctg gtgggcaact cgttggggcg gggaaccgcg 360
 gtccgggtttg cgtggaacta cccggcccgg gcaggacggt tagtgctgat gggcccgggg 420
 ggcttgagta tcaacctgtt tgcgcccgc cgcaccgagg gagtcaaacg gctgtcgaag 480
 ttctccgttg cggccaccgc ggagaacctc gaggcgttcc tgcgggtcat ggtctacgac 540
 aagaacctga tcacccccga gttggtggat cagcgggttg cgtggccag caccgccgag 600
 tcgttgacgg caacacgggc gatgggaaag tcgttcgccg gagccgactt cgaggccggc 660
 atgatgtggc gcgaggtgta tcggctgcgc cagccggtgt tgctgatctg gggctcgtgag 720
 gaccgggtca acccgctgga cggcgcgctg gttgcgttga aaacgattcc gcgtgcgcag 780
 ctgcacgtat tcgggcagtg tgggcattgg gtgcaggtgg agaagttcga cgagttcaac 840
 aagctgacga ttgaatttct gggaggtggc aga 873

<210> 267

<211> 188

<212> PRT

<213> Mycobacterium tuberculosis

<400> 267

Met Thr Arg Val Val Leu Ser Val Gly Ser Asn Leu Gly Asp Arg Leu
 1 5 10 15

Ala Arg Leu Arg Ser Val Ala Asp Gly Leu Gly Asp Ala Leu Ile Ala
 20 25 30

Ala Ser Pro Ile Tyr Glu Ala Asp Pro Trp Gly Gly Val Glu Gln Gly
 35 40 45

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Gln Phe Leu Asn Ala Val Leu Ile Ala Asp Asp Pro Thr Cys Glu Pro
 50 55 60
 Arg Glu Trp Leu Arg Arg Ala Gln Glu Phe Glu Arg Ala Ala Gly Arg
 65 70 75 80
 Val Arg Gly Gln Arg Trp Gly Pro Arg Asn Leu Asp Val Asp Leu Ile
 85 90 95
 Ala Cys Tyr Gln Thr Ser Ala Thr Glu Ala Leu Val Glu Val Thr Ala
 100 105 110
 Arg Glu Asn His Leu Thr Leu Pro His Pro Leu Ala His Leu Arg Ala
 115 120 125
 Phe Val Leu Ile Pro Trp Ile Ala Val Asp Pro Thr Ala Gln Leu Thr
 130 135 140
 Val Ala Gly Cys Pro Arg Pro Val Thr Arg Leu Leu Ala Glu Leu Glu
 145 150 155 160
 Pro Ala Asp Arg Asp Ser Val Arg Leu Phe Arg Pro Ser Phe Asp Leu
 165 170 175
 Asn Ser Arg His Pro Val Ser Arg Ala Pro Glu Ser
 180 185

<210> 268

<211> 564

<212> DNA

<213> Mycobacterium tuberculosis

<400> 268

atgacgcggg tagtgctctc gggtggctcc aacctgggtg accgcctggc acgattgcgg	60
tcggtcgccg acgggtctcgg cgatgcgttg attgcggctt ccccgatata tgaggccgac	120
ccctgggggtg ggggtggagca ggggcagttc ctcaatgcgg tgctgatcgc cgacgatcct	180
acctgcgaac cgcgggagtg gctgcggcgg gcgcaggagt tcgagcgcgc tgcgggcagg	240
gtgcgtggcc agcgtgggg tccacgaaat ctgcacgtcg acctgatcgc ctgctaccag	300
acctcggcca ccgaggctct ggtcgaagtg accgcgcggg agaaccacct cacgctgccg	360

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caccactgg cgcatctgcg ggcctttgtg ttgatcccggt ggattgccgt cgaccaaacg 420
 gcgcagctga cggttgccgg gtgcccgcgg cccgtcacgc gactgctggc cgagctggag 480
 cccgccgacc gcgacagtgt gcggttggtt aggccgtcgt tcgatctgaa tagcagacac 540
 cccgtcagtc gggcaccgga aagc 564

<210> 269

<211> 166

<212> PRT

<213> Mycobacterium tuberculosis

<400> 269

Leu Pro Gly Arg Val Phe Ala Ser Pro Ala Asp Phe Asn Thr Gln Leu
 1 5 10 15

Gln Ala Trp Leu Val Arg Ala Asn His Arg Gln His Arg Val Leu Gly
 20 25 30

Cys Arg Pro Ala Asp Arg Ile Glu Ala Asp Thr Ala Ala Met Leu Thr
 35 40 45

Leu Pro Pro Val Gly Pro Ser Ile Gly Trp Arg Thr Ser Thr Arg Leu
 50 55 60

Pro Arg Asp His Tyr Val Arg Leu Asp Gly Asn Asp Tyr Ser Val His
 65 70 75 80

Pro Val Ala Ile Gly Arg Arg Ile Glu Ile Thr Ala Asp Leu Ser Arg
 85 90 95

Val Arg Val Trp Cys Gly Gly Thr Leu Val Ala Asp His Asp Arg Ile
 100 105 110

Trp Ala Lys His Gln Thr Ile Ser Asp Pro Glu His Val Val Ala Ala
 115 120 125

Lys Leu Leu Arg Arg Lys Arg Phe Asp Ile Val Gly Pro Pro His His
 130 135 140

Val Glu Val Glu Gln Arg Leu Leu Thr Thr Tyr Asp Thr Val Leu Gly

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145

150

155

160

Leu Asp Gly Pro Val Ala
165

<210> 270

<211> 498

<212> DNA

<213> Mycobacterium tuberculosis

<400> 270

```

ttgccggggtc ggggtctttgc ctctccggcg gatttcaata cccagttgca ggcctggctg      60
gtgcggggcca atcaccgcca gcaccgagtg ctgggatgtc gaccggcaga tcgcatcgag      120
gccgataccg cagcgatgct gacattgccg ccgggtcgggc ccagcatcgg gtggcgaacc      180
tcgacacggc tgccgcgcga tcattacgtg cgcctcgacg gcaacgacta ctcggtgcat      240
ccggtcgcga tcggccggcg catcgagatc accgcagatc tgagccgggt ccgggtctgg      300
tgtggcggca ccctggtcgc cgatcatgac cgcattctggg ccaaacacca gacgatcagc      360
gatcccgagc atgtcgtggc cgccaaactg ctgcgacgca aacggttcga catcgtcggt      420
ccaccccacc acgttgaggt cgaacaacgt ctcttgacca cctacgacac cgtgttgggc      480
cttgacgggc cggtggcc

```

<210> 271

<211> 350

<212> PRT

<213> Mycobacterium tuberculosis

<400> 271

```

Met Leu Thr Asp Pro Gly Leu Arg Asp Glu Leu Asp Arg Val Ala Ala
1           5           10           15

```

```

Ala Val Gly Val Arg Val Val His Leu Gly Gly Arg His Pro Val Ser
20           25           30

```

```

Arg Lys Thr Trp Ser Ala Ala Ala Val Val Leu Asp His Ala Ala

```

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35	40	45
Ala Asp Arg Cys Gly Arg Leu Ala Leu Pro Arg Arg Thr His Val Ser		
50	55	60
Val Leu Thr Gly Thr Glu Ala Ala Thr Ala Thr Trp Ala Ala Ala Ile		
65	70	75
Thr Val Gly Ala Gln His Val Leu Arg Met Pro Glu Gln Glu Gly Glu		
	85	90
Leu Val Arg Glu Leu Ala Glu Ala Ala Glu Ser Ala Arg Asp Asp Gly		
	100	105
Ile Cys Gly Ala Val Val Ala Val Ile Gly Gly Arg Gly Gly Ala Gly		
	115	120
Ala Ser Leu Phe Ala Val Ala Leu Ala Gln Ala Ala Ala Asp Ala Leu		
	130	135
Leu Val Asp Leu Asp Pro Trp Ala Gly Gly Ile Asp Leu Leu Val Gly		
145	150	155
Gly Glu Thr Ala Pro Gly Leu Arg Trp Pro Asp Leu Ala Leu Gln Gly		
	165	170
Gly Arg Leu Asn Trp Ser Ala Val Arg Ala Ala Leu Pro Arg Pro Arg		
	180	185
Gly Ile Ser Val Leu Ser Gly Thr Arg Arg Gly Tyr Glu Leu Asp Ala		
	195	200
Gly Pro Val Asp Ala Val Ile Asp Ala Gly Arg Arg Gly Gly Val Thr		
	210	215
Val Val Cys Asp Leu Pro Arg Arg Leu Thr Asp Ala Thr Gln Ala Ala		
225	230	235
Leu Asp Ala Ala Asp Leu Val Val Leu Val Ser Pro Cys Asp Val Arg		
	245	250
Ala Cys Ala Ala Ala Ala Thr Met Ala Pro Val Leu Thr Ala Ile Asn		
	260	265
		270

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Pro Asn Leu Gly Leu Val Val Arg Gly Pro Ser Pro Gly Gly Leu Arg
 275 280 285

Ala Ala Glu Val Ala Asp Val Ala Gly Val Pro Leu Leu Ala Ser Met
 290 295 300

Arg Ala Gln Pro Arg Leu Ala Glu Gln Leu Glu His Gly Gly Leu Arg
 305 310 315 320

Leu Arg Arg Arg Ser Val Leu Ala Ser Ala Ala Arg Arg Val Leu Gly
 325 330 335

Val Leu Pro Arg Ala Gly Ser Gly Arg His Gly Arg Ala Ala
 340 345 350

<210> 272

<211> 1050

<212> DNA

<213> Mycobacterium tuberculosis

<400> 272

atgctgaccg atccgggggtt gcgcgacgag ctggaccgag tcgccgcagc cgtcgggggtt	60
cgcgttgttc atctcggcgg ccgccatccg gtgagcagaa agacgtggtc ggcggcggcg	120
gctgtggtgc tcgaccacgc ggcggcggac cgggtgtgggc ggctcgcgct accccggcgc	180
accacgtca gcgtgttgac cggaaccgaa gccgcgacgg cgacctgggc ggctgccata	240
accgtcgggg cccagcacgt gctgaggatg cccgagcagg aggggtgaact ggtccgcgag	300
ctcgccgaag ctgctgaatc ggcacgcgat gacgggatct gcggggcggt ggtcgcggtc	360
atcgggggtc gcggtggcgc tggggcatcg ttgtttgcgg ttgccctggc gcaggccgcc	420
gctgatgcgc tgttggtcga tctcgatccg tgggcggcg gcacgatct tctggtgggc	480
ggcgaaaccg cccccggtct gcgttgcccc gacctggcgc tacaggggtg acggctgaat	540
tggtcggcgg tgcgtgcggc attgccgcga ccgcggggga tcagcgtgct ctcggaact	600
cggcgcggct acgagttaga cgccgggccg gtggacgccg tgatcgacgc cggccgacgt	660
gggggagtca ccgtggtctg cgatcttcca cgtcgtctga ccgatgccac ccaagcagcg	720
ctggatgccg ccgatctcgt cgtcctggtc agcccatgcg atgtgcgggc atgtgcggcc	780
gccgcgacga tggcgctgt gctgaccgcg atcaaccca acctgggtct ggtggtgcgg	840

-341-

gggccctccc cgggggggatt gcgggcgga gaggtcgcg acgtcgccgg ggtgccgcta 900
 ctggcatcca tgagggccca gccgcggcta gccgaacagc tggaacacgg gggtcttcga 960
 ctgcgaacgg gatcggtgct ggcacggct gcccgcggg tacttggtgt gctgccacgt 1020
 gctgggtcag ggcgacacgg tagggcgga 1050

<210> 273

<211> 70

<212> PRT

<213> Mycobacterium tuberculosis

<400> 273

Met Ser Asp Cys Asn Val Leu Gly Gly Ala Leu Glu Gln Gly Gly Thr
 1 5 10 15

Asp Pro Leu Thr Gly Phe Tyr Arg Asp Gly Cys Cys Ala Thr Gly Pro
 20 25 30

Glu Asp Leu Gly Trp His Thr Ile Cys Ala Val Met Thr Thr Glu Phe
 35 40 45

Leu Ala His Gln Arg Ser Val Gly Asn Asp Leu Ser Ile Ala Arg Pro
 50 55 60

Pro Arg Trp Leu Arg Pro
 65 70

<210> 274

<211> 210

<212> DNA

<213> Mycobacterium tuberculosis

<400> 274
 atgtccgatt gcaatgtgct gggcggcgcc ctggaacagg gtggcaccga tccgcttacc 60
 ggcttctatc gtgacggctg ctgtgcgacc ggacccgagg acctcggttg gcacaccatc 120
 tgcgccgtca tgaccaccga attcctggca caccagcgct cggtcggcaa cgacctgtcg 180

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attgcgcgcc cgccacggtg gctgcgcct

210

<210> 275

<211> 846

<212> PRT

<213> Mycobacterium tuberculosis

<400> 275

Met Ala Pro Leu Ala Val Asp Pro Ala Ala Leu Asp Ser Ala Gly Gly
 1 5 10 15

Ala Val Val Ala Ala Gly Ala Gly Leu Gly Ala Val Ile Ser Ser Leu
 20 25 30

Thr Ala Ala Leu Ala Gly Cys Ala Gly Met Ala Gly Asp Asp Pro Ala
 35 40 45

Gly Ala Val Phe Gly Arg Ser Tyr Asp Gly Ser Ala Ala Ala Leu Val
 50 55 60

Gln Ala Met Ser Val Ala Arg Asn Gly Leu Cys Asn Leu Gly Asp Gly
 65 70 75 80

Val Arg Met Ser Ala His Asn Tyr Ser Leu Ala Glu Ala Met Ser Asp
 85 90 95

Val Ala Gly Arg Ala Ala Pro Leu Pro Ala Pro Pro Pro Ser Gly Cys
 100 105 110

Val Gly Val Gly Ala Pro Pro Ser Ala Val Gly Gly Gly Gly Gly Ala
 115 120 125

Pro Lys Gly Trp Gly Trp Val Ala Pro Tyr Ile Gly Met Ile Trp Pro
 130 135 140

Asn Gly Asp Ser Thr Lys Leu Arg Ala Ala Ala Val Ala Trp Arg Ser
 145 150 155 160

Ala Gly Thr Gln Phe Ala Leu Thr Glu Ile Gln Ser Thr Ala Gly Pro
 165 170 175

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Met Gly Val Ile Arg Ala Gln Gln Leu Pro Glu Ala Gly Leu Ile Glu
180 185 190

Ser Ala Phe Ala Asp Ala Tyr Ala Ser Thr Thr Ala Val Val Gly Gln
195 200 205

Cys His Gln Leu Ala Ala Gln Leu Asp Ala Tyr Ala Ala Arg Ile Asp
210 215 220

Ala Val His Ala Ala Val Leu Asp Leu Leu Ala Arg Ile Cys Asp Pro
225 230 235 240

Leu Thr Gly Ile Lys Glu Val Trp Glu Phe Leu Thr Asp Gln Asp Glu
245 250 255

Asp Glu Ile Gln Arg Ile Ala His Asp Ile Ala Val Val Val Asp Gln
260 265 270

Phe Ser Gly Glu Val Asp Ala Leu Ala Ala Glu Ile Thr Ala Val Val
275 280 285

Ser His Ala Glu Ala Val Ile Thr Ala Met Ala Asp His Ala Gly Lys
290 295 300

Gln Trp Asp Arg Phe Leu His Ser Asn Pro Val Gly Val Val Ile Asp
305 310 315 320

Gly Thr Gly Gln Gln Leu Lys Gly Phe Gly Glu Glu Ala Phe Gly Met
325 330 335

Ala Lys Asp Ser Trp Asp Leu Gly Pro Leu Arg Ala Ser Ile Asp Pro
340 345 350

Phe Gly Trp Tyr Arg Ser Trp Glu Glu Met Leu Thr Gly Met Ala Pro
355 360 365

Leu Ala Gly Leu Gly Gly Glu Asn Ala Pro Gly Val Val Glu Ser Trp
370 375 380

Lys Gln Phe Gly Lys Ser Leu Ile His Trp Asp Glu Trp Thr Thr Asn
385 390 395 400

Pro Asn Glu Ala Leu Gly Lys Thr Val Phe Asp Ala Ala Thr Leu Ala
405 410 415

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Leu Pro Gly Gly Pro Leu Ser Lys Leu Gly Ser Lys Gly Arg Asp Ile
 420 425 430

Leu Ala Gly Val Arg Gly Leu Lys Glu Arg Leu Glu Pro Thr Thr Pro
 435 440 445

His Leu Glu Pro Pro Ala Thr Pro Pro Arg Pro Gly Pro Gln Pro Pro
 450 455 460

Arg Ile Glu Pro Pro Glu Ser Gly His Pro Ala Pro Ala Pro Ala Ala
 465 470 475 480

Lys Pro Ala Pro Val Pro Ala Asn Gly Pro Leu Pro His Ser Pro Thr
 485 490 495

Glu Ser Lys Pro Pro Pro Val Asp Arg Pro Ala Glu Pro Val Ala Pro
 500 505 510

Ser Ser Ala Ser Ala Gly Gln Pro Arg Val Ser Ala Ala Thr Thr Pro
 515 520 525

Gly Thr His Val Pro His Gly Leu Pro Gln Pro Gly Glu His Val Pro
 530 535 540

Ala Gln Ala Pro Pro Ala Thr Thr Leu Leu Gly Gly Pro Pro Val Glu
 545 550 555 560

Ser Ala Pro Ala Thr Ala His Gln Pro Gln Trp Ala Thr Thr Pro Ala
 565 570 575

Ala Pro Ala Ala Ala Pro His Ser Thr Pro Gly Gly Val His Ser Thr
 580 585 590

Glu Ser Gly Pro His Gly Arg Ser Leu Ser Ala His Gly Ser Glu Pro
 595 600 605

Thr His Asp Gly Ala Ser His Gly Ser Gly His Gly Ser Gly Ser Glu
 610 615 620

Pro Pro Gly Leu His Ala Pro His Arg Glu Gln Gln Leu Ala Met His
 625 630 635 640

Ser Asn Glu Pro Ala Gly Glu Gly Trp His Arg Leu Ser Asp Glu Ala

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645										650										655																									
Val	Asp	Pro	Gln	Tyr	Gly	Glu	Pro	Leu	Ser	Arg	His	Trp	Asp	Phe	Thr																														
			660					665						670																															
Asp	Asn	Pro	Ala	Asp	Arg	Ser	Arg	Ile	Asn	Pro	Val	Val	Ala	Gln	Leu																														
			675					680						685																															
Met	Glu	Asp	Pro	Asn	Ala	Pro	Phe	Gly	Arg	Asp	Pro	Gln	Gly	Gln	Pro																														
			690					695						700																															
Tyr	Thr	Gln	Glu	Arg	Tyr	Gln	Glu	Arg	Phe	Asn	Ser	Val	Gly	Pro	Trp																														
			705					710						715																															
Gly	Gln	Gln	Tyr	Ser	Asn	Phe	Pro	Pro	Asn	Asn	Gly	Ala	Val	Pro	Gly																														
				725										730																															
Thr	Arg	Ile	Ala	Tyr	Thr	Asn	Leu	Glu	Lys	Phe	Leu	Ser	Asp	Tyr	Gly																														
				740										745																															
Pro	Gln	Leu	Asp	Arg	Ile	Gly	Gly	Asp	Gln	Gly	Lys	Tyr	Leu	Ala	Ile																														
				755										760																															
Met	Glu	His	Gly	Arg	Pro	Ala	Ser	Trp	Glu	Gln	Arg	Ala	Leu	His	Val																														
				770										775																															
Thr	Ser	Leu	Arg	Asp	Pro	Tyr	His	Ala	Tyr	Thr	Ile	Asp	Trp	Leu	Pro																														
Glu	Gly	Trp	Phe	Ile	Glu	Val	Ser	Glu	Val	Ala	Pro	Gly	Cys	Gly	Gln																														
				805										810																															
Pro	Gly	Gly	Ser	Ile	Gln	Val	Arg	Ile	Phe	Asp	His	Gln	Asn	Glu	Met																														
				820										825																															
Arg	Lys	Val	Glu	Glu	Leu	Ile	Arg	Arg	Gly	Val	Leu	Arg	Gln																																
				835										840																															

<210> 276

<211> 2538

<212> DNA

<213> Mycobacterium tuberculosis

<400> 276

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gcgggtgcgg gtttgggtgc ggtgatctcg tcgctgaccg cggcgctggc cgggtgtgcg	120
gggatggccg gtgatgatcc ggctggggcg gtgttcgggc gtcctatga cggttcggcg	180
gccgcgctgg tgcaggcgat gtcgggtggc cgcaacggat tgtgcaacct cggcgatggg	240
gtgcgcatga gcgcgcacaa ctactcgttg gccgaggcga tgtcggatgt cgctgggcgg	300
gcggcgccgt tgcgggcgc gccgcgcgagc ggctgtgtcg gcgtgggtgc gccgcgctcg	360
gcggtcggtg gcggcggtgg cggcccgaag ggctgggggt ggggtggccc gtatatcggg	420
atgatctggc cgaacgggga ttcgacaaag ctacgtgcgg cggctgtggc gtggcgcgagc	480
gcgggcacgc agttcgcgct gactgagatt cagtcgacgg cggggccgat gggcgttatt	540
cgcgcccagc agctcccga ggcggggctg atcgagtcgg cgtttgctga cgcgtacgcc	600
agcaccaccg ctgtcgtggg ccaatgccac cagctggcgg ccagctaga cgcctatgcc	660
gcccgcatcg acgcggtgca tgcggcggtc ctggatttgt tggcccgcat ctgcgatccg	720
ctgaccggga tcaaagaggt gtgggagttt ctgaccgacc aggacgaaga cgagatccag	780
cgcctcggcc atgacatcgc ggtggtggtc gaccagttca gcggggaagt ggacgcgttg	840
gctgcggaga tcaccgcggt ggtgtcgcac gccgaggcgg tgatcaccgc gatggcagac	900
cacgcaggca aacaatggga tcggttcttg cacagcaacc cggtggtgtg ggtcatcgat	960
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gagatgctga ctgggatggc gccgctggcg ggctggggcg gcgagaacgc tcccggcggtt	1140
gtggagtcgt ggaagcagtt cggcaaaagc ctcatccatt gggatgagtg gacgaccaac	1200
cctaataagg cgctaggcaa gaccgtattc gacgccgcga cgctagcttt gccgggcggg	1260
ccgctgtcga aacttggcag caagggccgc gacattctcg cgggcgtgcg aggcctcaag	1320
gagcggcttg agccgacgac accgcacctt gagccccag caacgccgcc gcggccagga	1380
ccgcaaccac cacggatcga accaccagaa tcggggccacc cggcaccgc gccgcggcg	1440
aaaccggcgc ccgtgcccgc caacggtcca ctgccgcaca gcccaccga atccaaaccg	1500
ccgcccgtcg acagaccggc tgaaccggtg gcgccgtcgt cggcgtcggc aggcagccc	1560
cgggtatccg cagccaccac gcccggcaca catgtgccgc atggcctgcc gcaaccgggt	1620
gaacatgtcc cggcgcaagc accaccggcg acgacgttgc ttggcggacc tcctgtcgag	1680

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tcagcgcccg ctaccgcgca ccaaccccag tgggcgacca caccagcagc acccgcgggcg 1740
gcgccgcatt ccacgcccgg aggcgttcac tcaaccgaat cggggcctca cggccgatca 1800
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agcggtagcg agccacctgg gctgcatgcg ccgcatcgcg agcagcagct tgcaatgcat 1920
tcgaacgaac cagctggaga gggttggcat cggttatccg acgaagcggg tgacccgcag 1980
tatggcgagc cattatcgcg ccactgggac ttacagaca atccggccga tcgcagtcgg 2040
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gagggatggt tcatcgaagt atctgaggtc gcgccggggg gcggccagcc gggcggatcc 2460
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cgcggggtgt tgcgacag 2538

```

<210> 277

<211> 115

<212> PRT

<213> Mycobacterium tuberculosis

<400> 277

```

Met Phe Leu Ala Gly Val Leu Cys Met Cys Ala Ala Ala Ala Ser Ala
1           5           10          15

```

```

Leu Phe Gly Ser Trp Ser Leu Cys His Thr Pro Thr Ala Asp Pro Thr
          20          25          30

```

```

Ala Leu Ala Leu Arg Ala Met Ala Pro Thr Gln Leu Ala Ala Ala Val
          35          40          45

```

```

Met Leu Ala Ala Gly Gly Val Val Ala Val Ala Ala Pro Gly His Thr
          50          55          60

```

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Ala Leu Met Val Val Ile Val Cys Ile Ala Gly Ala Val Gly Thr Leu
65 70 75 80

Ala Ala Gly Ser Trp Gln Ser Ala Gln Tyr Ala Leu Arg Arg Glu Thr
85 90 95

Ala Ser Pro Thr Ala Asn Cys Val Gly Ser Cys Ala Val Cys Thr Gln
100 105 110

Ala Cys His
115

<210> 278

<211> 345

<212> DNA

<213> Mycobacterium tuberculosis

<400> 278

atgttctctcg cgggtgtgct gtgcatgtgt gcggcggcgg cgtccgccct gttcggggagc 60
tggtcgctgt gccatacgcc cactgccgac cccacggcgc tggcgctgcg cgcgatggcg 120
cccacgcagt tggcagccgc agtaatgctg gccgccgggg gagtgggtggc ggtggccgcg 180
cccgggcaca ccgccttgat ggtggtgatc gtctgcattg cgggcgcggg cggcacgctg 240
gccgcggggg cgtggcagag cgcccagtag gcgctgcgcc gtgaaaccgc tagccccacc 300
gccaactgcg ttggcagctg cgcggtctgc acccaggcct gtcac 345

<210> 279

<211> 236

<212> PRT

<213> Mycobacterium tuberculosis

<400> 279

Met Gly Gly Met Asp Thr Gly Val Thr Ser Pro Arg Val Leu Val Val
1 5 10 15

Asp Asp Asp Ser Asp Val Leu Ala Ser Leu Glu Arg Gly Leu Arg Leu
20 25 30

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Ser Gly Phe Glu Val Ala Thr Ala Val Asp Gly Ala Glu Ala Leu Arg
 35 40 45

Ser Ala Thr Glu Asn Arg Pro Asp Ala Ile Val Leu Asp Ile Asn Met
 50 55 60

Pro Val Leu Asp Gly Val Ser Val Val Thr Ala Leu Arg Ala Met Asp
 65 70 75 80

Asn Asp Val Pro Val Cys Val Leu Ser Ala Arg Ser Ser Val Asp Asp
 85 90 95

Arg Val Ala Gly Leu Glu Ala Gly Ala Asp Asp Tyr Leu Val Lys Pro
 100 105 110

Phe Val Leu Ala Glu Leu Val Ala Arg Val Lys Ala Leu Leu Arg Arg
 115 120 125

Arg Gly Ser Thr Ala Thr Ser Ser Ser Glu Thr Ile Thr Val Gly Pro
 130 135 140

Leu Glu Val Asp Ile Pro Gly Arg Arg Ala Arg Val Asn Gly Val Asp
 145 150 155 160

Val Asp Leu Thr Lys Arg Glu Phe Asp Leu Leu Ala Val Leu Ala Glu
 165 170 175

His Lys Thr Ala Val Leu Ser Arg Ala Gln Leu Leu Glu Leu Val Trp
 180 185 190

Gly Tyr Asp Phe Ala Ala Asp Thr Asn Val Val Asp Val Phe Ile Gly
 195 200 205

Tyr Leu Arg Arg Lys Leu Glu Ala Gly Gly Gly Pro Arg Leu Leu His
 210 215 220

Thr Val Arg Gly Val Gly Phe Val Leu Arg Met Gln
 225 230 235

<210> 280

<211> 708

<212> DNA

-350-

<213> *Mycobacterium tuberculosis*

<400> 280

```

atgggcggca tggacactgg tgtgacctca cctcgggtgt tggtcgtcga cgacgactcc      60
gatgtgctcg cctcgtctga acgcggctta cggctgtccg gattcgaggt agcgaccgcg      120
gtggacggcg ccgaggcctt gcgcagcgcc accgagaacc ggccggacgc gatcgtgctc      180
gacatcaaca tgccagtgtc cgatggagtc agcgtcgtga cggcactacg cgcgatggac      240
aacgacgtcc cggctctgtgt gctatccgca cgcagctctg tcgatgaccg agtggccgga      300
ttggaggccg gcgccgacga ttacctggtg aaaccgttcg tgctggccga gctggtggca      360
cgggtgaagg cgctgctgcg ccgcccgggc tccactgcaa cgtcgtcctc ggaaaccatc      420
acggtggggc cgctggaggt ggacatcccc ggccggcggg cccgggtcaa cggcgtcgac      480
gtcgacctga ccaagcgca attcgacctg ctgcgggtgc tggccgagca caagaccgcg      540
gtgctctccc gagcgcaact cctggaattg gtgtggggct acgacttcgc cgccgacacc      600
aacgtggtgg acgtcttcat cgggtacctg cggcgcaaac tggaggccgg cgggtggccct      660
aggctgctgc ataccgtccg cggagtcgga ttcgtgctgc gtatgcag                      708

```

<210> 281

<211> 112

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 281

```

Met Ala Ala Leu Val Arg Glu Val Val Gly Asp Val Leu Arg Gly Ala
1           5           10          15

```

```

Arg Met Ser Gln Gly Arg Thr Leu Arg Glu Val Ser Asp Ser Ala Arg
          20          25          30

```

```

Val Ser Leu Gly Tyr Leu Ser Glu Ile Glu Arg Gly Arg Lys Glu Pro
          35          40          45

```

```

Ser Ser Glu Leu Leu Ser Ala Ile Cys Thr Ala Leu Gln Leu Pro Leu
          50          55          60

```

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Ser Val Val Leu Ile Asp Ala Gly Glu Arg Met Ala Arg Gln Glu Arg
 65 70 75 80

Leu Ala Arg Ala Thr Pro Ala Gly Arg Ala Thr Gly Ala Thr Ile Asp
 85 90 95

Ala Ser Thr Lys Val Val Ile Ala Pro Val Val Ser Leu Ala Val Ala
 100 105 110

<210> 282

<211> 336

<212> DNA

<213> Mycobacterium tuberculosis

<400> 282

atggcggctt tggcgcgtga ggctggttggg gacgtgctgc gcggagcgcg gatgtcgcag 60
 ggtcggacgc tgcgcgaggt gtccgattcg gcgcgggtga gcctcgggta tctgtcggag 120
 atcgagcgcg gtcgcaagga gccttcacgc gagctgctca gtgcgatttg tacggctctg 180
 cagctcccggt tgcgggtggg gctcatcgat gcgggcgagc ggatggcgcg tcaagagcgc 240
 cttgcccgcg ccaccccggc tggcagagca accggcgcca ccattgacgc cagcaccaag 300
 gtcgtcattg cgccggtggg gtcgctggcg gtggcc 336

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